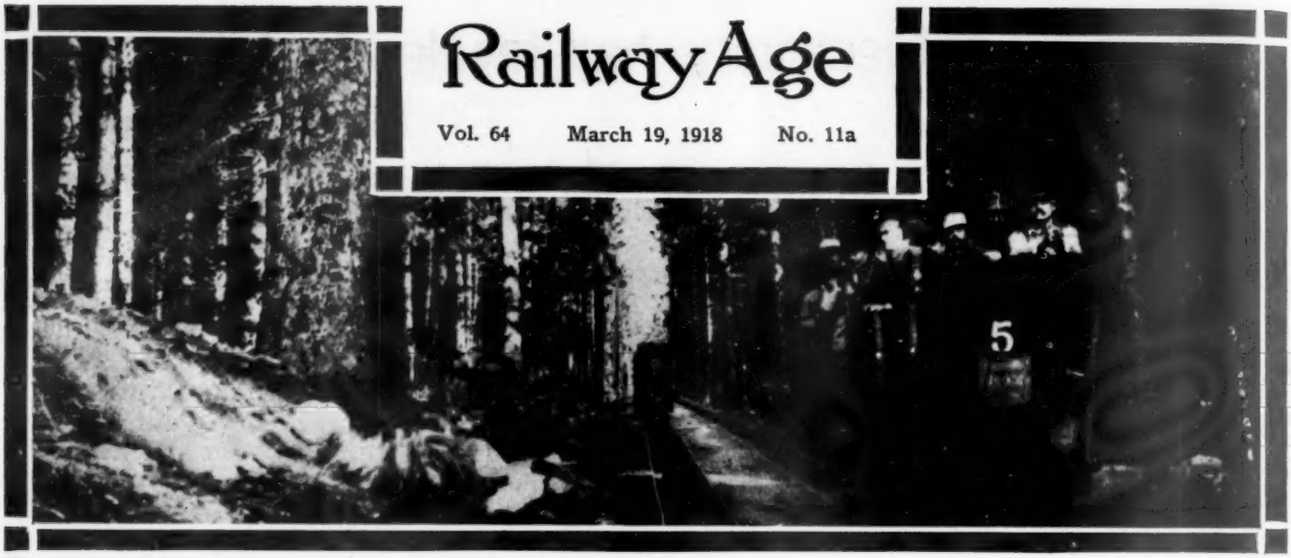
Railway Age

Vol. 64 March 19, 1918 No. 11a



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WE GUARANTEE, that of this issue, 5,607 copies were printed; that of these 5,607 copies, 4,300 were mailed or delivered by messenger to regular paid subscribers; 800 were distributed among members and guests of the Railway Signal Association and at the Coliseum; 325 copies were provided for office use to fill future orders; 100 copies were mailed to advertisers, and 82 copies were mailed as samples.

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ROY V. WRIGHT, Managing Editor.

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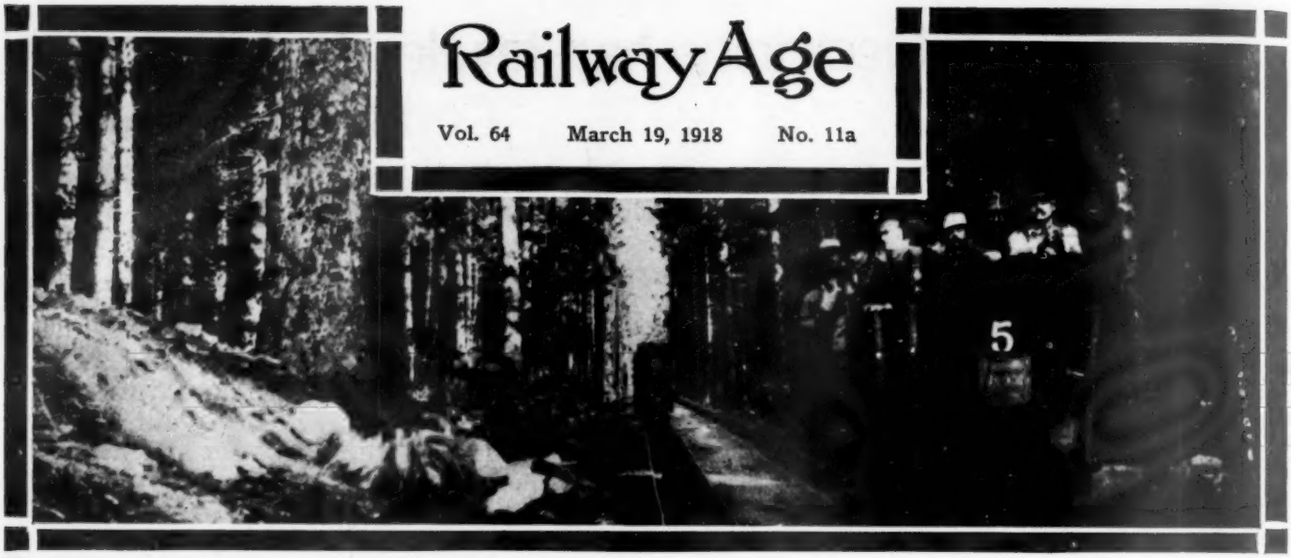

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Railway Age

EDITORIAL

DAILY EDITION

The Associations and Standardization

The government is devoting considerable attention at the present time to the standardization of equipment for use on the railways under government control. At present efforts to standardize equipment are being directed towards new motive power and rolling stock. Within certain limits standardization of equipment and materials is desirable, but it can be carried to such a point that efficiency is materially reduced. It can also be carried to such a point that modernized ideas and new devices of merit will be eliminated without a trial. When standardization approaches this point its power for harm is greater than that for good. Through such organizations as the R. S. A. and the A. R. E. A. standardization is proceeding along the proper lines. Designs of material for adoption are submitted to the associations only after careful and thorough investigation and study has been made by committees working in conjunction with the manufacturers. By this method new devices may be submitted and tried out and those having merit can be substituted for or adopted in place of existing standards. Along these lines standardization is progressive, not retrogressive. The associations are doing good work and all members should see that standardization proceeds along right lines.

R. S. A. Members in Military Service

On another page is an article describing the activities of the various members of the Railway Signal Association who are now serving in a military capacity. An effort has been made to present as accurate a list of men now in service as it was possible to obtain from the records. It is to be hoped that all members knowing of others who are in the service or who may enter the service in the future make it a point to notify the secretary of the Association in order that the R. S. A. Roll of Honor may be kept complete and up-to-date.

The association can look with pride upon its members who have already entered military service. It goes without saying that these men will live up to the high reputation which railway men from this continent have already earned in the present war. A number of the members have been drafted into the government service, but a greater number have volunteered and been assigned to special regiments, for which duty their special technical and practical experiences especially fits them. To date about 30 members have entered government service and several of this number are already in active duty "over there."

Each member of the Railway Signal Association who is in the army should be represented by a star in a service flag, which should be displayed at future meetings. This method of evidencing patriotism has been adopted by almost all organizations as a constant reminder of absent members who are fighting for liberty. An R. S. A. service flag would also be a reminder for those who stay at home that they have an equally patriotic duty to perform in keeping the transportation facilities of our country operating with the highest degree of efficiency. The men who have given up their civil life to do the actual fighting should have our support at all times—let us get behind them.

Regional Committee Meetings

It is to be noted with satisfaction that there continues to be a good attendance of signal men at the regional committee meetings of the Railway Signal Association. Through the activity of these committees the work of the Association is not confined to certain parts of the country, but covers all sections, and a large number of the younger men engaged in signal work have an opportunity to attend such meetings when they are unable to attend the stated meetings. The information obtained at such meetings is always of a constructive nature and, as the younger men are encouraged to take part in the discussion of matters before these meetings, their interest in the Association is not only increased, but their work also has an added interest for them. For the meetings to be of the greatest value, the regional chairmen should arrange a program in advance that will be of general interest to the signal men in their vicinities. These meetings should of necessity be arranged far enough in advance that proper notice may be sent to the men interested. Knowing the subject to be discussed, the men attending these meetings will make a study of conditions that affect their work and be in a position to take an active part in any discussion. It is to be hoped that signal officers will recognize the good being done by the regional committee meetings by encouraging their men to attend whenever it is at all possible, for these regional committees will naturally have a very important part to play in the advancement of good signaling practice.

The R. S. A. and Existing Conditions

One year ago this month the outlook for a signal convention was decidedly bad. Just prior to the time of the convention a strike of the train service employees of the railways was threatening which would have rendered it impracticable to hold either the R. S. A. or the A. R. E. A. conventions. The crisis was ended when the Conference Committee of the railways gave full authority to the government mediators to settle the controversy. As a consequence the attendance the first day or so was small compared to the attendance when normal conditions prevail, although considering the circumstances the attendance was much better than was expected. Many events have transpired during the last 12 months which have been of very great importance not only to the country as a whole but to the railroads as well. The two outstanding events of this period are the entrance of the United States into the world war and the assumption of control of the railway systems of the country by the Government. On the assumption of government control con-

ditions from a railroad officer's standpoint, were naturally confusing. With this condition of affairs existing there was doubt as to whether the various railroad organizations should proceed with their plans for holding the conventions as scheduled before this action. The association has accomplished excellent results heretofore in connection with matters relating to the signal field and considering the important part signals play in the movement of traffic it is essential and fitting that the R. S. A. should continue its good work. If ever there was a time when all members should get behind the Association and boost the good work, that time is the present.

A Fine Display of Courage and Enterprise

THE MEMBERS OF THE AMERICAN RAILWAY ENGINEERING ASSOCIATION, the Railway Signal Association and the National Railway Appliances Association deserve the warmest commendation for having had the intelligence and the courage to hold their conventions and exhibit as usual this spring.

The *Railway Age* is not among those publications that have contended for "business as usual" during the war. "Business as usual," as that phrase has been generally employed, means conducting as usual those businesses which are not essential to carrying on the war, as well as those which are. This is impossible; and it would be undesirable if it were possible. The main business of the nation as long as the war lasts will be that of conducting the war; and during this time every other consideration and object must be subordinated to the object of triumphing over the nation's enemies. Any business the conducting of which "as usual" will not contribute toward winning the war must be put on an entirely new basis.

But the railroad business is not one of those which are not essential in time of war. On the contrary, it is of all industries the one whose efficient management is the most essential to the winning of the war. Since this is the case, it follows that nothing which has been done in the past to maintain and increase the efficiency of the railways should now be discontinued, and that everything new which can be done to maintain and increase their efficiency should now be done.

The conventions of the various railway associations have been held, and the various exhibits of railway equipment and appliances have been given in the past, upon the assumption that the full discussion by railway men, from all over their country, of problems common to them, and the inspection by them of the improved and new devices brought forward by the various railway equipment and supply companies, would tend to maintain and increase the efficiency of the railways. Has that assumption been false or true? If it has been false, then railway conventions should not have been held or exhibits given when the railways were under private control, and the railway men and railway supply men have hypocritically or foolishly wasted their time and their companies' money on them. On the other hand, if the conventions and exhibits did increase efficiency under private control, they will do so under government control, and it would be hypocritical or foolish to discontinue holding them under government control.

Indeed, if there was good reason for having them under private control, there is even more reason for having them under government control; for there is greater need for the utmost efficiency than there ever was before; and since the railways are being operated as a single system it is more than ever the duty of railway officers freely to exchange views and information which will be of use to all of them in their work.

That the conventions and exhibits of the various associations in the past have contributed toward increasing the physical and operating efficiency of American railways the *Railway Age* has not the slightest doubt; yet since this country entered the war, and especially since government control was adopted, many conventions and exhibits have been discontinued. We believe that most of the organizations which have adopted this policy have taken counsel of timidity, rather than of courage and good judgment. The Railroad Administration has never issued an order or a statement, nor given any intimation of its views, so far as we know, tending to discourage conventions and exhibits.

Whatever others may have done, the Railway Engineering Association, the Railway Signal Association and the National Railway Appliances Association, being sure that their conventions and exhibit are legitimate and helpful activities, have gone ahead and arranged to hold them this year as usual. It required much courage to do this. The final decision had to be made some months ago, in the midst of a winter of such terrible severity, and a demoralization of transportation so unprecedented, that they might have shaken the stoutest hearts.

The *Railway Age* congratulates the officers of these associations on the sound judgment and great courage they have shown. And now that the convention and exhibit are being held, let all make the very most of them.

We venture especially to urge upon all railway officers that it is not only their opportunity, but their peculiar duty, this year to vist the exhibit as often and study it as much as they can. In the first place, the railway supply companies have shown wonderful enterprise and courage in preparing such an exhibit as they have under the conditions that have existed; and it would be positively mean for railway officers not to show their appreciation of what they have done. In the second place, because of the labor situation, there never in history was such acute need for railway engineering and maintenance of way officers to inform themselves regarding the efficiency-producing devices which the railway supply craft is offering to them.

The associations have done well in deciding to carry on business "as usual" this spring. Let those attending so do their work that when the week is ended they can look back upon it as the most useful week's work for the railways of America, and the people of America, that they have ever done!

The Influence of Passing Sidings on Track Capacity

ONE OF THE SUBJECTS ASSIGNED to Committee 10—Signaling Practice, was to report on the problem of signaling single track roads with reference to the effect of signaling and the proper location of passing sidings on the capacity of the line. Part of the work done in this connection has been to apply and test formulæ and methods on sections of roads.

In this connection an analysis of the effect of passing track locations on an 88-mile section of line was presented. This particular piece of line is used exclusively for freight service and has no large yards or junction points. The running time of the trains as presented in parts of the report was obtained by computation from the tractive efforts of the locomotives in use with their full theoretical tonnage for ruling grades. As more uni-

form results are obtained than would be possible by taking actual figures from riding trains unless the average of a large number were obtained, an analysis was made, using all the present passing tracks with their present capacity and a schedule worked out graphically showing existing conditions. The minimum time between trains was found by ascertaining the maximum sum of the schedules between passing sidings. It was found that, in using all the present passing tracks, cases existed where they were so close together that the delayed time was large. Furthermore, certain of these tracks could be eliminated, and the minimum time between trains could still be maintained, with a decrease in the delayed time to southward trains waiting at meeting points. Another schedule was also worked out showing the proposed rearrangement of passing sidings in order to obtain the maximum capacity of the line. In this rearrangement it was proposed that certain existing tracks be extended to 100 cars capacity, these extensions to be in the direction which would give the best balance of time, taking into consideration curves, grades, highway crossings, etc.

In connection with this study the assumption was made that when a track is operating at full capacity each train will meet an opposing train at each passing siding. A comparison between the present and the proposed methods shows that the theoretical capacity in trains per day under present methods would be 27 on a basis of 100 per cent, and that, under proposed methods, this could be increased to 45 or 167 per cent and that the theoretical capacity measured in freight cars per day under the present arrangement was 1,863 on the basis of 100 per cent while that under the proposed method would be 4,500 or 242 per cent. The analysis made by this committee shows what a decided effect the proper location of passing sidings has upon the capacity of a main track. At the present time this subject is worthy of the most careful consideration by operating officers and where it is found that a material increase can be effected the necessary steps should be taken to increase the track capacity. The indications are that little trouble will be experienced by the railroad officers in getting the necessary money from the government to carry out betterments of this character.

The R. S. A. Registration

THE ATTENDANCE AT THE Railway Signal Association meeting far exceeded the expectations of the most optimistic members. It was thought that the conditions on the railways of the country might be of such seriousness as to prevent the officers and employees from attending the convention in as great numbers as they have in the past. The registration yesterday showed that there were 61 associate, 14 junior and 123 active members in attendance, or a total of 198 members. In addition there were 14 visitors present, making a total attendance of 212.

Of the active members attending the meeting last year, 17 came from points east of Buffalo and Pittsburgh, while the registration this year showed that 39 active members came from the same section. These figures show that the members are taking an active interest in the work of the Association at a most favorable time and are entering into discussions which are of especial interest.

Early in the year it was thought by some that the Association should cancel its meetings while present conditions continued to exist. That this would have been unwise was amply demonstrated by the work of Committee X—Signaling Practice, with especial reference to the study made by this committee on the relocation of passing sidings to increased track capacity.

This committee has demonstrated that by the proper relocation of passing sidings on unsignaled lines, track capacity can be increased as much as 65 per cent. Another signal engineer was able to demonstrate that, with the proper relocation of passing sidings, it was unnecessary to build a cut-off that was thought necessary.

By work such as this the Signal Association is performing a very great service to the roads when increased track capacity at the present time is of such great importance.

Tickets for the Annual Dinner

Tickets for the annual dinner which will be termed a "War-Fare" dinner, will be placed on sale in the corridor outside of the Convention hall at twelve o'clock this noon. The dinner will be held as usual in the Gold Room of the Congress Hotel on Wednesday evening. The speakers will include Sir Edmund Walker, president of the Canadian Bank of Commerce, Toronto, who will speak on "Canada's Part in the War"; Edward N. Kelsey, governor of the International Association of Rotary Clubs, whose topic will be "Good Fellowship," and Rev. Stephen K. Mahon, the title of whose address will be "Unsolved Problems." It had been hoped that William G. McAdoo, director-general of railways, would be present, but he was forced to decline the invitation owing to the pressure of his duties.

The A. R. E. A. Convention Program

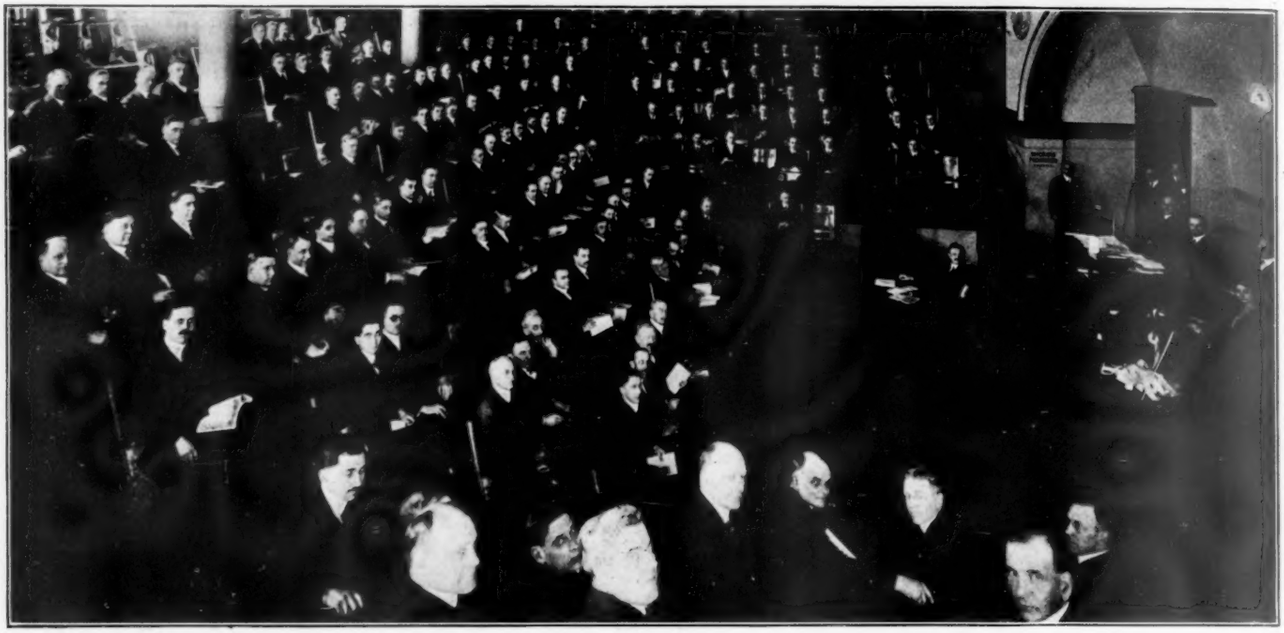
The American Railway Engineering Association will assemble in the Florentine Room of the Congress Hotel for its 19th annual convention at ten o'clock this morning. Following the address of the president and the presentation of the reports of the secretary-treasurer, the reports of the standing and special committees will be taken up in the following order:

Tuesday, March 19—
- Signals and Interlocking.
- Conservation of Natural Resources.
- Buildings.
- Track.
- Water Service.
- Records and Accounts.

Wednesday, March 20—
- Electricity.
- Yards and Terminals.
- Economics of Railway Labor. Illustrated use of labor-saving devices.
- Ballast. Illustrated use of mechanical tampers.
- Economics of Railway Operation.
- Uniform General Contract Forms.
- Roadway.

Thursday, March 21—
- Iron and Steel Structures.
- Wooden Bridges and Trestles.
- Masonry.
- Ties.
- Stresses in Railroad Track.
- Rail.
- Signs, Fences and Crossings.
- Rules and Organization.
- Wood Preservation.

It is planned to devote most of Wednesday to the consideration of the report of the Committee on Economics of Railway Labor and to other phases of the labor problem.



The R. S. A. Stated Meeting in Session

Railway Signal Association Stated Meeting

Complete Abstracts of Reports of the Committees Presented at Monday's Sessions With Discussions

THE MARCH STATED MEETING of the Railway Signal Association was held in the Auditorium Hotel, Chicago, on Monday, March 18. The morning session was called to order at 9:45 by President W. N. Elliott, signal engineer, New York Central Lines East, and adjourned at 12:45 p. m. The meeting reconvened at 2:15 and continued until 4:30 p. m.

After the meeting was called to order Mr. Elliott announced the death on February 2 of Charles C. Rosenberg, secretary-treasurer, and expressed briefly the esteem in which Mr. Rosenberg was held by the association.

To enable all who desired to express their appreciation of the association's and the individual members' loss in Mr. Rosenberg's death, the President announced a memorial service would be held as near three o'clock as possible. During this service resolutions were presented by F. P. Patenall, signal engineer of the B. & O., as follows:

WHEREAS, Almighty God, in the exercise of His divine will, has removed from this world and from our midst our late secretary-treasurer, C. C. Rosenberg, and

WHEREAS, It is but just that a fitting recognition of Mr. Rosenberg's many virtues should be had; therefore we, members of the Railway Signal Association, have paused in our labors to pay our last sad tribute to his memory, and to express our deep appreciation of the many and lasting obligations that we as members and friends owe to him, and by words and outward tokens, to express our sorrow for the irreparable loss our association has sustained by his death.

W. H. Elliott, President

THEREFORE, BE IT RESOLVED, That in the death of C. C. Rosenberg, this association laments the loss of an efficient officer, and a man whose utmost endeavors were exerted for its welfare and prosperity; a friend and companion who was dear to us all; a citizen whose upright and noble life was a standard of emulation to those about him.

RESOLVED, That the heartfelt sympathy of the members of this Association be extended to his sorrowing family in their affliction.

RESOLVED, That these resolutions be spread upon the records of the Association, and an engrossed copy thereof be sent to the family of the departed.

On motion, duly seconded and carried, the resolutions were unanimously adopted.

In order to carry on the work of the secretary-treasurer, the Board of Direction at its meeting on February 17 last elected H. S. Balliet, assistant terminal manager, Grand Central Terminal, as assistant secretary-treasurer to serve until the next annual meeting, with full authority to perform the duties of treasurer, as specified in the constitution. Mr. Balliet has been performing these duties since that time. The Board has now elected Mr. Balliet secretary-treasurer, to serve until the next annual meeting.

At the morning session before the committees submitted their reports the president introduced Frank Rhea of the Department of Commerce, Washington, D. C., who gave a brief talk on trade opportunities in foreign countries. His address appears elsewhere in this issue.

The proceedings of the convention were interrupted during the morning session while James A. Davis of the War Savings Committee for Cook County gave a brief talk on "Stimulating an appreciation of the principles of the Association as to the advantages to accrue through thrift, as well as the patriotic motive in helping raise funds with which to win the war."

The secretary made the request that the regional committees send in their reports for the next meeting before June 1.

Committee XIII on Electrical Testing presented a drawing covering an adjustable resistance, which gave rise to spirited discussion. While some of the members wished to have this drawing accepted for submission at the annual meeting, feeling that while the resistance would not meet all conditions it was a step in the right direction and improvements could be made later as found necessary. The majority voted not to consider it for presentation to the annual convention.

Frank Rhea Speaks on Trade Opportunities

AT THE OPENING OF YESTERDAY'S session of the Railway Signal Association Frank Rhea, of the United States Department of Commerce, spoke on Trade Opportunities in the Far East. Mr. Rhea, who is a member of the Railway Signal Association and also of the American Railway Engineering Association, was formerly connected with the Interstate Commerce Commission, resigning over a year ago to accept an assignment with the Department of Commerce to investigate the markets for railway supplies in Australia and Asia. Mr. Rhea has just returned from a year in those countries and is now engaged in the preparation of his report. In discussing his observations yesterday morning Mr. Rhea spoke in part as follows:

Frank Rhea

"I have just returned from the far East and am now engaged in making up my report. I spent one month in New Zealand, four months in Australia, and seven months in China, Japan and Manchuria. The object of the trip was to investigate the markets for those classes of railway materials, equipment and supplies, which could be furnished by our American manufacturers. In New Zealand and Australia I saw little in the way of railway signals which we could incorporate to advantage in our American practice. In New Zealand, Mr. Wynne, the signal engineer, has worked out the best arrangement of a pick-up and discharge of tyre tablets which I have ever seen. I watched it working a great many times with trains moving at speeds of about 30 miles an hour and never saw a single failure.

"In New Zealand and Australia the general arrangement of signalling in the past has followed the British Board of Trade methods. In Australia, however, they are adopting three speed three position American signaling very rapidly, this already having occurred to a considerable extent in South Australia and Victoria, and to some extent in New South Wales and Queensland, while it will undoubtedly be adopted in Western Australia.

"One very excellent arrangement which I investigated was installation of selective telephones for train running, under an arrangement which they call "central control" and continue to use all the other staff apparatus. This arrangement was giving excellent results and it is probable that this scheme goes about as far in expediting the traffic as practical, while still retaining all the features of complete safety of operation. The British railroad man looks with suspicion on the word "despatching." In fact, to him the despatching method of running trains is synonymous with careless train running. Therefore, in referring to this method I found it better to use the word "central control" instead of telephone despatching.

The labor situation in Australia probably deserves all that has ever been said of it, but the conditions are strikingly different from those with which we are familiar in America, in that the common labor is the organization which entirely dominates the situation, rather than the skilled and more highly paid trades. The railways are manufacturing many of the requirements in their own shops, at times doing this at a higher cost than that for which they could be purchased, but doing so for the reason that labor demands employment. The organizations of the railways are more highly departmental than anything we have in the United States. In fact, this is so much so that I have termed it the branch method of organization, the cleavage between the branches being very distinct, and extending in every instance to the administrative head of the department. The method of train operation is what I have termed the 'station master method.' By this I mean that instead of despatching methods of running trains, the trains are controlled and directed by the station master at each station as they proceed over the line. This method is no doubt necessary in such countries as China and Japan, but is not as expeditious an arrangement as the one above described under central control, or as our despatching methods.

In China and Japan the railways are organized and operated much along the same methods as in Australia, except that the station master method is much more of a necessity on account of the class of help employed by the railroads. The Japanese railways are all government owned and are exceedingly interesting instances of the results of government ownership. The South Manchurian railway, which is actually owned by the Japanese government and administered by the Colonial department, is probably one of the most successful cases of government ownership in the world today. The employees of the Japanese railways, however, are to all intents and purposes a part of a military organization. Every employee is ranked and graded, and every official is in uniform, even to the extent of carrying a small sword. We have heard a great deal about the aggressiveness of the Japanese, but if their position is to be understood one has to take into account the fact that they have an inadequate supply of steel and fuel, and that their anxiety to secure control of

adequate supplies is one of the reasons why they are attempting to secure these supplies from China. The Chinese railways are operated under the same scheme of organization. There is no doubt that China is one of the best examples in the world today that trade follows investment. The financial control of the Chinese railways has in the past very largely determined the awarding of the business. In my report I expect to make certain suggestions regarding the refunding of certain of the Chinese railway obligations. This suggestion is made for the reason that the Chinese railways today are earning good returns on the investment, and there is no doubt that additional railways can be built and earn handsome returns in the future.

In Australia the American signalling concerns have representatives on the ground who are looking after the business in a very satisfactory manner, and it is probably about as well taken care of as any other branch of the railway market.

I would like to call attention to two points which I consider important in the handling of foreign business. One is the necessity of sending either seasoned, experienced men, or younger men if they are of good material, but it should be understood that they should go under contract for very considerable periods, at least for five years, and preferably for ten years. The other point is the necessity of American concerns protecting their interests by taking out patents in Japan. The issuing of patents in Japan is done in accordance with the international agreement on patent laws. While American concerns may do very little business in the future in Japan, in my opinion it is necessary to protect American interests in competitive territory by devices which may be made in Japan in case the patent situation is not protected.

Report of Committee VII—Direct Current Relays

THE COMMITTEE submitted reports on the following subjects:

1. Recommended resistance of track relay.
2. Table showing minimum resistance allowable in series with track battery for track circuits.

The committee presented the following statements on which it based its conclusion relative to the use of the 2-ohm vs. the 4-ohm relay:

1. Because of its lower operating voltage, the 2-ohm relay will operate with a lower ballast resistance.
2. The 2-ohm relay is less susceptible to leakage current from adjacent battery entering track circuit through insulated joints.
3. The energy consumption for the 2-ohm relay on equal track circuits is approximately fifty per cent less when the track is occupied. When the track is not occupied the energy consumption will be less when the ballast resistance is less than five ohms per thousand feet.
4. The length of track circuit may be increased with the use of the 2-ohm relay if no foreign current is present and the resistance between the battery and track is not less than the recommended limiting resistance.
5. On track circuits of equal length the 2-ohm relay gives equally as good protection against broken rail where no foreign current is present.
6. On track circuits of equal length, the 2-ohm relay will release with a higher shunting resistance across the rails when foreign current entering the track circuit is less than .350 amperes.
7. Considering track circuits of equal length and with other conditions equal, no definite recommendations can be made in favor of either the 2-ohm or the 4-ohm relay where foreign current is present, on account of there being conditions where each has its advantages over the other.
8. With a foreign current present, the 2-ohm relay on a track circuit of its maximum operable length will receive more combined foreign and track battery current than will be received by a 4-ohm relay on a track circuit of its maximum operable length.
9. When a battery lead or a rail is broken and the track circuit between the break and the relay is shunted, the 2-ohm relay will be more susceptible to foreign current than the 4-ohm relay. With the track circuit not shunted, the 2-ohm relay will be more readily picked up by foreign current only when the current enters the track circuit through a resistance less than 5 ohms.

In view of the above statements, the committee recommended the use of the 2-ohm relay with caustic soda battery, provided the recommended limiting resistance is used in series with the battery. The recommended limiting resistance should also be used in series with the battery wherever the 4-ohm relay is used with caustic soda battery.

It was recommended that the above statements be accepted for presentation to the Annual Convention for approval and submission to letter ballot for insertion in the Manual.

Table of Minimum Resistance Allowable in Series with Track Battery

The committee recommended that the past practice of using a battery of three gravity cells in multiple (without added external resistance) and a 4-ohm relay be adopted as a basis of a standard in determining the limiting or external resistance for use in connection with track circuit operation.

The following table is computed on the above assumption and covers batteries containing every known type of primary or storage cells.

Battery Voltage Limits.		
4-ohm Relay.	2-ohm Relay.	Minimum Resistance between Battery and Track Ohm.
.27- .51	.19- .35	.1
.52- 76	.36- .52	.2
.77-1.01	.53- .69	.3
1.02-1.26	.70- .86	.4
1.27-1.51	.87-1.03	.5
1.52-1.77	1.04-1.21	.6
1.78-2.02	1.22-1.38	.7
2.03-2 27	1.39-1.55	.8
2.28-2.52	1.56-1.72	.9
2.53-2.77	1.73-1.89	1.0
2.78-3.02	1.90-2.06	1.1
3.03-3.27	2.07-2.24	1.2
3.28-3.52	2.25-2.41	1.3

The voltage given in the table refers to the maximum operating voltage of the track circuit battery when the current from the battery is the minimum possible with a .06-ohm train shunt, with the recommended resistance between battery and track, and with assumed adverse operating conditions. This operating voltage can be determined for a battery of any type, number and arrangement of cells, by measuring at 21 degrees C. (70° Fahr.) the voltage of the whole battery when its discharge is

2.5 amperes, if 4-ohm relays are to be used, or 1.7 amperes, if 2-ohm relays are to be used.

It was recommended that this table be accepted for presentation to the Annual Convention for approval and submission to letter ballot for insertion in the Manual.

Committee: E. G. Stradling (C. I. & L.), chairman; James Anderson (N. Y. C.), vice-chairman; E. T. Ambach (B. & O. S. W.), B. H. Ayers (L. & N.), C. W. Burrows, D. M. Case (Southern), A. R. Fugina (L. & N.), E. W. Kolb (B. R. & P.), H. W. Lewis (L. V.), A. E. Pratt (Erie), C. A. Veale (S. P. Co.).

Discussion

E. G. Stradling (chairman): The first half of the report on relays is presented for discussion, not for motion.

E. G. Hawkins (N. Y. C.): Does section 3 of the report refer to equal track circuits?

Mr. Stradling: If we had them equal, we would have to have all track conditions equal.

Mr. Hawkins: It refers to power rather than current?

Mr. Stradling. No, more to current. To effect saving on your batteries is the idea.

T. S. Stevens (A. T. & S. F.): Referring to paragraph six, does that mean the current measured between its possible source and the track, or across the rails?

Mr. Stradling: Across the rails. I would like to make a motion that the Association approve the use of the two-ohm relay with a caustic soda battery, this motion to be submitted to a letter ballot.

Mr. Hawkins: Referring back to number three, if all things were equal, you would think with the circuit occupied, the consumption of the current would be the same.

Mr. Stradling: With your two-ohm relay you can put more resistance in the consumption of your batteries, which will choke back the flow of the current.

A. R. Fugina (L. & N.): As to the matter of determining what the ballast resistance is of your track circuit, that can be done by taking your R. S. A. formulas, that have been developed by the Committee on Testing, and finding what the balance of resistance is.

F. B. Wiegand: I would like to ask the committee if they recommend track circuits of equal length or greater length when using two-ohm relays?

Mr. Stradling: Equal with the four-ohm relay.

Mr. Wiegand: What I would like to determine is whether the committee recommends a track circuit of equal length or greater length, when using a four-ohm relay than when using a two-ohm relay.

Mr. Stradling: We recommend greater for the two-ohm relay.

B. T. Anderson (D. L. & W.): In paragraph 3 reference is made to ballast resistance less than five ohms per thousand feet. I would like to get the percentage of all track circuits that are less than five ohms.

Mr. Stradling: I don't know that I can answer you on that.

Mr. Anderson: Do you recommend the use of the two-ohm relay on all track circuits, or just on track circuits less than five ohms?

Mr. Stradling: On all track circuits.

P. M. Gault: I would like to ask if the committee has considered any other relay than the two-ohm relay? They compare the two-ohm with the four-ohm, but they have mentioned no other resistance. That would lead us to think from this report that there are but two types of track relays.

Mr. Stradling: Our answers here are from 35 railroads, which shows that there were no other resistances used except four ohms, consequently we compared the two-ohm with the four-ohm.

H. G. Morgan (I. C.): The Illinois Central has been using relays of three ohms quite considerably. We have found that the total energy consumption for dry as well as wet conditions will be practically the same and from 8 to 10 per cent less than the two-ohm relay on the same track circuit, and our experience seems to be that the three-ohm relay will operate with more efficiency on the track circuits on the voltages that are within the range. You can operate on our track circuit on two-ohm relays as well as you can on three, but with the three-ohm relays you can do it at less cost. They will operate with less cost and a higher voltage resistance than the two-ohm.

G. H. Dryden (B. & O.): I understand that in the conclusion the two-ohm relay is worked only where a constant battery is used.

Mr. Stradling: That is true.

Mr. Dryden: Are we not producing a dangerous condition, if the two-ohm relay is considered unsafe unless a particular battery is used for its operation? Can we force our repairmen to keep one type of battery on the circuits constantly? Again, in criticizing the same subject one year ago, I stated at that time that I did not understand why the three gravity cells in multiple with added external resistance to a four-ohm relay should be adopted as a basic standard covering the external resistance in connection with track operation. I am of the same opinion still, that this basis of conclusion was wrong, and that the safe working current to relay coils is the proper basis for the conclusion of this committee. I will ask to hear something on that subject.

Mr. Wiegand: Another point, with reference to the committee recommending the use of long track sections, when using the two-ohm relay. I would like to know why the committee recommended the longer track section when in article 8 they say, "With a foreign current present, the two-ohm relay on a track circuit of its maximum operable length will receive more combined foreign and track battery current than will be received by a four-ohm relay on a track circuit of its maximum operable length." And then in article 9 they say: "When a battery lead or a rail is broken and the track circuit between the break and the relay is shunted, the two-ohm relay will be more susceptible to foreign current than the four-ohm relay." Would it not be better to confirm the two-ohm relay to the same length of track circuit as the four-ohm relays?

Mr. Stradling: We give you these arguments relating to foreign current conditions for your information. We know that there are many track circuits where you do not have foreign current, and probably will not have, and therefore why not make them as long as possible and use the two-ohm relay?

Mr. Anderson: I question whether it is clear to all the members, as to what the committee is actually recommending, as superior. Do I understand that the committee is recommending the two-ohm for 400-ft. track circuits?

Mr. Stradling: We recommend it for all lengths of track circuits, but give you the information so that you will have the advantage of being able to use it for longer track circuits, in the case of the two-ohm relay.

Mr. Anderson: I am considering the conditions on roads where the track circuits run anywhere from 200 to 500 ft. in length. I think most of the members will agree that on a short track circuit in interlocking limits the four-ohm relay can be operated at less cost than the two-ohm relay. It seems to me unless it is generally

understood that is the case it would be foolish to recommend the two-ohm relay if it will cost more for battery material.

Mr. Fugina: It will be difficult to recommend a relay for all conditions. We do not recommend the two-ohm relay as one which can be used for every track circuit, and be the safest relay that may be used and also the most economical. We are attempting only to recommend the relay that generally is the best for the battery. For that reason we have set out in these conclusions certain conditions in which the two-ohm relay is not as advisable as the four-ohm relay. Likewise there are some conditions obtaining where the four-ohm relay is not advisable to be used, and those of us who are in charge of this work know the conditions under which we may simply use a two-ohm relay, the conditions under which we should use a four-ohm relay, and also the conditions under which we should use the larger relays.

L. R. Mann (M. P.): I notice the committee says: "In view of the above statements, your committee recommends the use of the two-ohm relay with caustic soda battery, provided the recommended limiting resistance is used in series with the battery." What is the object of that provision?

C. F. Stoltz (C. C. C. & St. L.): The idea is if you have a storage battery which carries about two volts, there is nothing to be gained by putting enough resistance into it to consume the wattage and get your voltage down to operate a two-ohm relay. If you have plenty of voltage, there is no necessity for going to the lower resistance relay.

The idea of the motion was to recommend that the association sanctioned the use of a two-ohm relay as a safe proposition.

Mr. Mann: Would it not be advisable in cases where there is plenty of voltage that they use the eight-ohm relay?

T. S. Stevens: As I understand the recommendation of the committee, they simply ask us in a conservative way to lend our sanction towards using the two-ohm relay. I think the committee's recommendations are very good and very conservative, and I hope the resolution will meet with the approval of this meeting for submission to the annual convention.

Mr. Mann: I think the motion of the committee is good and would support that if they would qualify it; that is, I don't know that the two-ohm relay has been in enough practical use to make an absolute recommendation.

Mr. Dryden: Our road is using two-ohm relays. I think we have at least 300 or 400 in use. The point that we want to bring out is whether or not it is a safe relay provided we increase our voltage. Is it a safe relay if we multiple ourselves? Is it a safe relay if we use a caustic soda battery of higher voltage? In this committee's report they should not confine themselves to the use of a certain battery, but rather to a certain voltage or working current. The relay is safe under normal operating conditions, regardless of the kind of battery used.

Mr. Stoltz: As to the safety of the two-ohm relays, there are probably 35,000 or 40,000 four-ohm relays being operated by caustic soda batteries at the present time, and the Association has never given any sanction to caustic soda batteries with four-ohm relays without external resistance. There is a greater chance of an unsafe condition with a four-ohm relay and no external resistance in a caustic soda battery, much greater than there is with a two-ohm relay and external resistance.

Ray Marshall (G. N.): The report refers to the feasibility of operating track circuits of greater length where the two-ohm relays are used than with the four-ohm. That might be misleading, for the reason that often after track circuits are installed, conditions in the territory change, and where originally no foreign current was found it appears later. Would it not be better to standardize the length of track circuits, and apply either two or four ohm relays as conditions require?

A. Dobson (N. Y. H. N. & H.): I would like to straighten out the last part of that clause which speaks of foreign current entering track circuit through resistance of less than five ohms. Foreign current enters the track circuit usually along the rails. There will be one track circuit perhaps at some place where foreign current comes onto that particular track circuit, but all the other track circuits that are affected by this particular source of foreign current receive this current through the rails, therefore that current has to flow through or upon the insulated joint. That brings us to the point at once that in the great majority of cases where foreign current is found on track circuits, it enters that track circuit through resistance considerably greater than five ohms, because it must at least flow through the insulated joint before it reaches the track circuit, as well as through the other resistance which it may encounter between the source and the rails.

In regard to the amount of current which is supposed to be flowing along the rails, not across the track, it does not matter what the resistance of the relay is usually, the amount of foreign current that will flow from rail to rail will be the same whether the relay is two ohms or four ohms, on an average, and the resistances back of them are so great that a resistance of two or four ohms but very slightly affects the current.

There is another point that has not been brought out in this meeting. It is stated that the four-ohm relay would be safer in cases where a potash battery was used if all the resistance between the battery and the track was gone. A four-ohm relay would be safer under those circumstances than a two-ohm relay. That is true as a bald statement, but the thing that operates a track relay is the shunt, and it is the resistance of the shunt upon which depends the amount of current that will flow from the relay. To give you just roughly some figures that will show the difference under those two conditions with no resistance between the rail and the battery, with a two-ohm relay and a shunt across the battery end, the resistance of the shunt necessary to lower the current enough for the relay to drop away is something like .0016. With a four-ohm relay, under the same conditions the resistance necessary to lower this current enough for drop-away purposes is .0014, a very slight difference when you speak of it in actual figures.

Mr. Stradling's motion was then seconded and carried.

Mr. Stradling: The final portion of our report relates to the "Battery voltage limits." The committee feels that the table given is vitally important to the railroads using caustic soda batteries, either with four- or two- ohm relays.

Mr. Anderson: As I understand this table, it refers to only one type of potash battery—it does not refer to the potash track battery?

Mr. Stradling: It refers to any battery that has this voltage, even to the storage battery.

E. G. Hawkins (N. Y. C.): Referring to the latter part of the paragraph, where it refers to the discharge in connection with the four-ohm relays in 2.5 amperes, if the four-ohm relays are to be used, or in 1.7 amperes,

if two-ohm relays are to be used, is it necessary to discharge the 2.5 amperes with four ohms and only 1.7 amperes with two ohms?

R. W. Erwin (Nat. Carbon Co.): The current figures there as shown in that part of the paragraph are merely to enable you to determine at what place in this table your batteries should come under, and we have used here the minimum of a .06-ohm train shunt, and we have assumed the most adverse operating conditions. You ask why there is a difference in the two relays? The current value for the relays was the standard R. S. A. value, and these vary with the train shunt permissible and the different current values that go with the voltage life.

Report of Committee III—Power Interlocking

THE COMMITTEE reported progress on the subject, "Prepare unit specification for electric motor switch operating and locking mechanisms," and also submitted drawings of typical circuits for power interlockings. The circuits were assigned last year, but were not completed in time for submission to the annual convention.

Progress was reported on the subject, "Prepare Specification for Fiber Conduit." The report is about completed, and it is expected to be presented for discussion at the New York meeting.

Progress was reported on the subject, "Prepare Unit Specification for Electric Interlocking Machine." The committee also submitted a report, "Requisites for First Range Voltage, Electric Interlocking." A report on this subject was submitted at the last annual convention, and referred back to the committee. The committee has considered the recommendations made at the annual convention, and again submitted the report for discussion at this meeting.

Typical Circuits for Power Interlocking

The subject matter presented under this heading consisted of three drawings for Federal Signal Company's electric interlocking. They are for:

110-volt d.c. one-arm non-automatic signal.

110-volt d.c. switch and lock movement.

20-volt d.c. switch and lock movement.

The committee submitted the circuit drawings for Federal Signal Company's Electric Interlocking, and asked their acceptance for approval at the next annual convention, as information.

Requisites for First Range Voltage

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1. The rated voltage for the operation of the switch mechanism shall be 20 volts.

2. The time required for the operation of the switch mechanism shall not exceed 30 seconds at rated voltage, nor shall the time exceed 40 seconds with voltage at 20 per cent below rated voltage.

3. Provision shall be made in the design of the switch mechanism to prevent an unauthorized movement.

4. The switch mechanism shall be so constructed as to permit an emergency operation. Provision to be made for automatically interrupting the operating circuit during such emergency operation.

5. Rails of track circuit shall be connected in series so far as practicable.

6. Signals governing movements from the siding shall be of the {automatic / semi-automatic stick} type.

7. Normal and restricted speed signals governing movements on the main line, shall be of the {automatic / semi-automatic} type.

8. Approach signals or slow boards shall be installed on the main line.

9. {Approach / Time} locking shall be installed.

10. Repeater or lock indication for switches and signals shall be provided at point of control.

11. Operation of switch mechanism shall be controlled by {section / sectional route} locking.

12. The circuits controlling the switch mechanism shall provide protection from unauthorized movements due to disarrangement of conductors.

13. The normal and restricted speed signals shall be so controlled that unless all switches, movable point frogs and derails over which they govern, are in proper position and locked, the signals will assume the stop position.

14. The opening through which the hand crank for emergency operation is to be applied on the switch mechanism shall be provided with a weatherproof cover attached to mechanism case and equipped for purchaser's standard switch padlock. Location to be conspicuously marked.

The committee submitted the Requisites for First Range Voltage Electric Interlocking, and asked their acceptance for approval at the next annual convention, as information.

Committee: F. B. Wiegand (N. Y. C.), chairman; I. S. Raymer (P. & L. E.), vice-chairman; F. W. Pfieging (U. P.), vice-chairman; Daniel Cushing (Un. Ter. Co.), A. B. DuBray (I. C. C.), N. S. Lynch (Mo. Pac.), J. W. MacCormack (K. C. Ter. Co.), O. R. Unger (Mo. Pac.), J. B. Weigel (L. & N.), G. A. Ziehlke (U. P.), B. J. Schwendt (T. & O. C.), H. L. Kilian (N. Y. C.), H. H. Orr (C. & E. I.), Loy Parnell (Wabash), J. C. Seaman (N. Y. C.), T. C. Seifert (C. B. & Q.), W. C. Sibila (N. Y. C.), A. H. Schott (M. C. R. R.), G. H. Burnette (Monongahela Ry.), W. D. Carroll (B. & O.), G. A. Motry (B. & O.), G. Toft (P. R. R.), L. E. Kinch (P. R. R.), E. C. Hitchcock (N. Y. N. H. & H.), C. G. McCauley (Wash. Term. Co.), G. R. Scattergood (P. R. R.), Charles Soper (L. I.), G. C. Whitney (N. Y. Mun. Ry.), Jacque Stoltz (N. Y. C.), Thorn Birdseye (P. R. R.), Walter Tyler (L. I.).

Discussion

Chairman Wiegand: The committee has submitted the drawings for submission to the annual convention. I move they be accepted.

(Motion seconded and carried.)

Mr. Wiegand: The committee again presents a report on requisites for first range voltage, electric interlocking.

A. R. Fugina (G. N.): I believe paragraphs 3 and 4 are rather advisable, though I am not entirely sure. I would like to know just how they expect this to be done; how are you going to control the unauthorized movement?

Mr. Wiegand: The committee's report is only on what might be termed requisites covering the construction of machines. Sub-committee B is now handling the units

of specifications. In the specifications which will be submitted with our next report, I feel that that will be taken care of, and the report will show just how it can be done. Just now I could not say.

Mr. Fugina: Are the low voltage machines that are now being placed on the market manufactured according to this provision?

Mr. Wiegand: That is something I could not say. I understand, however, that requisites can be made. The committee are working with the manufacturers, and so far as I know there has been no question in regard to meeting this particular requisite.

The committee offers a suggestion. It desires to reword section 7 as follows: "Signals governing normal and restricted speed movements on the main line shall be of the automatic, semi-automatic type."

In 8 a change in the wording is recommended by the committee: "Signals that may give approach indication or slow board shall be installed on the main line." In 13, a change in wording is suggested: "Signals that may give the normal or unrestricted speed indications shall be so controlled that unless all switches, movable point frogs and derails over which they govern are in proper position and locked, the signals will assume the stop position."

(On motion the recommendations were approved and the committee was excused, with the thanks of the Association.)

Report of Committee VI—Standard Designs

THE COMMITTEE PRESENTED ten drawings; one of which is a revision of a previous issue, eight are new designs, and one is presented for discussion.

The following revised and new drawings were submitted (with the exception of 1258, which is submitted for discussion only) for discussion and presentation to the annual meeting for approval and submission to letter ballot:

1362—Ladder Parts. (New.)
1363—Ladder Hand Rails. (New.)
1364—Ladder Platforms. (New.)
1365—Ladders for Ground Mast Signals. (New.)
1366—Ladders for Bracket Mast Signals. (New.)
1371—Ladder Clamps and Stays. (New.)
1372—Ladders for Bracket Posts. (New.)
1376—Double Tang Ends. (New.)
1065—Signal Blades. (Change in title only—revised.)
1258—Assembly of Fittings for Locking Switches Mechanically at Interlocking Plants. (New.)

Committee: F. P. Patenall (B. & O.), chairman; J. C. Mock (M. C.), vice-chairman; W. A. Hanert (N. Y. C.), C. J. Kelloway (A. C. L.), B. H. Mann (Mo. Pac.), F. W. Pfleging (U. P.), W. M. Post (P. R. R.), M. E. Smith (D. L. & W.), R. E. Trout (St. L.-S. F.).

Manufacturers' representatives: J. W. Hackett (Fed Sig. Co.), W. P. Neubert (U. S. & S. Co.), H. B. Taylor (Hall Sw. & Sig. Co.), S. N. Wight (Gen. Ry. Sig. Co.).

Discussion

Mr. Patenall: Your committee presents 10 drawings, one of which is a revision of the previous issue with some new designs, and one is presented for discussion. We would like to have you first discuss the drawing on ladder parts. The attempt of the committee at this meeting is to present a plan which we hope will hold good for some time. The object is to provide a ladder which will be applicable to all types of signals, keeping in mind the matter of providing more safety for our men working on these masts. We ask the approval of the plan for presentation to the annual meeting, and final submission to letter ballot.

Mr. Morrison: How much will this increase the cost of signals?

Mr. Patenall: This committee has not made any study of what the additional cost of the ladder will be, but in a general way we would assume that the platform will add two or three dollars to the cost of the ladder.

C. A. Dunham (G. N.): The committee has stated that one of the main objects is to make it a little safer for the man who has occasion to climb the signal masts. I would like to ask if the increased width of the ladder shown at the head of the drawing as 1 ft. 11 in. in width will not introduce a complication wherever signal masts are located between tracks on minimum clearances?

Mr. Patenall: With a new design used in connection with the signal mast, either in the case of the mechanism or a wider platform used in connection with the mast, the ladder will prohibit the placing of the signal unless you have sufficient track centers and of course the fact that you do use a wider platform means that your clearance diagram may be encroached on by this particular arrangement.

Mr. Dunham: In the light of what has just been said, there would seem to be considerable objection to adopting a standard requiring a ladder 1 ft. 11 in. in width for general use.

Mr. Patenall: You understand that the lower arm on the standard signal was located in reference to clearances, and that being the case its platform, if provided, will also be well outside the clearance diagram, so that we do not experience any difficulty in applying these platforms, and in the case of any particular mast, in connection with which you desire to use these platforms, we would assume that the particular mast is outside of the standard clearance diagram today.

(The drawing was accepted for presentation to the annual meeting for approval and submission to letter ballot.)

Mr. Patenall then presented plans 1363, 1364, 1365, 1366, 1371 and 1372, having to do with ladder parts, all of which were approved for presentation to the annual meeting and submission to letter ballot. Similar action was taken on plans 1376 and 1065.

Mr. Patenall: I want to make a personal appeal to this meeting on the question of painting signal blades, as well as an appeal to reduce the number of different dimensions. I communicated this last year with 89 railroads on the subject of painting and sizes of signal blades, and Heinz' 57 varieties of pickles were not in it when it came to signals. We ought not to allow a condition to exist in this country where we have so many varieties and sizes. I hope next year at this time someone will be able to report that 95 per cent of the railways are using R. S. A. standard blades.

At the meeting in New York last year there was considerable discussion on the question of a plan which

would show the mechanical locking of switches. The plan, 1258, you have before you bears out the recommendation made by Committee II, and we present this plan for argument and discussion. The members will note particularly the operating rod and the lock rod are inclined vertically, rather than in the ordinary way. As a matter of strength, the committee has to concede that there is a great deal in placing switch rods in that way, although that is not a new method. You will note the adjustable arrangement of the lock rod, which admits of fine adjustment. Another specialty is in the adjustment of the operating switch rod sockets, which is a detail I think the members might desire to study rather carefully. This plan embodies also the rectangular block. We would like to hear from the members on this particular point.

Mr. Stradling: I would like to offer a suggestion that in the connection of the switch block or lock rod to the front rod, that the same bolts be used for that connection that are used for getting the adjustment on the front rod.

Mr. Patenall: I think the point made by Mr. Stradling is quite apropos. There is apparently a means of saving two volts by doing what he says. I would also like to hear from the members who use adjustable rail braces as a general practice.

Mr. Dunham: Plan 1258 certainly embodies many important features. If this plan is adopted it means a very appreciable departure from what is now general practice in several details. The lock or plunger casting, as we usually call it, now in general use, so far as I know has generally been very satisfactory, and if that is true, then what is the necessity for adopting a new design which requires the use of several parts not now standard? There is another point. Gage plates, as shown here, are insulated by means of turning the ends up, which may be a very good insulating proposition, but is there not objection from the standpoint of such ends being turned up and raising something in the track that a man would fall over?

I would also like to ask the committee if the spacing of the first head rod and the lock rod is in accordance with the dimensions submitted for approval by Committee II at various times. Touching the question that Mr. Patenall raised concerning the use of adjustable rail braces. My own experience is that the solid rail brace is best. The occasion for the use of an adjustable rail brace comes about largely from the ties being driven down, and when the signal repair man feels that he needs an adjustment, he tries to introduce it perhaps by stretching the rail brace, when what he really needs is to have the ties tamped up to the rails. The tendency is for the track gage to spread a little, and you do not really correct the matter properly by adjusting the rail brace.

The only occasion, as I see it, for the use of an adjustable rail brace is to overcome the wear in the brace. I am assuming, of course, that the brace is sufficiently rigid to stand the strain without bending.

Mr. Morrison: In our experience we found that it was difficult to keep the switches sufficiently tight, but by the introduction of the adjustable rail brace we have overcome that difficulty. Perhaps we are shy a few section men to keep our ties tamped; perhaps we have heavy motive power, and perhaps we use our switches a great deal at big terminals, but the adjustable rail brace has overcome our difficulties satisfactorily.

F. J. Ackerman (Kansas City Terminal): The terminal proposition, of course, at Kansas City, is decidedly different, and what I may say would not apply in a good many instances. We have used the adjustable rail brace in that terminal territory since 1914. From past experience and observation I should say that results have been very good in this, and that I consider that we have been able to keep those adjustments and save much labor which might be required otherwise in resetting risers or shrinking plates.

As to the locking device, we have experienced no difficulty in keeping the switches in proper adjustment, which we could not have done if we had the solid rail braces.

F. B. Wiegand (N. Y. C.): We have been using the non-adjustable rail brace and up to the present time we have found no necessity for any adjustable brace. It is our practice to use the blade that is cut in the center, and so far we have found no necessity for tying the blades together as shown on the drawing.

Paul M. Gault (I. C.): I have been wondering whether the triple rods, as shown here, will prevent turning of the points. The rods we have been accustomed to use are made flat, and offhand it would appear to me that the points would tend to roll in this type of rod. Also, as to the method of insulating the tie-plates. Many roads are having satisfactory results by cutting off a few inches of the tie-plates.

Mr. Patenall: The purpose of the position of the rods as shown on this drawing is specifically to prevent the point turning. Under the old methods of applying the rods flat, we know that we did not get the results which we expected. It seems to have developed on some railroads that there has been a tendency for the point to turn under obstruction. That is not a point particularly made by this committee, but was given as a reason for the application of the rod by the committee.

It is a very difficult thing, in drawing a plan of this kind, to decide whether we shall have adjustable rail braces or whether we shall not. Someone called attention to the drilling as shown on the plan. We have no authority at this time for the drilling, other than the standard drilling of the A. R. E. A., and until that is changed we must abide by that plan. Someone mentioned the gage plate. This, of course, is the gage plate. An application which leaves a space between the plates on the tie without any connection at all cannot be considered a gage plate.

The committee has attempted to make tests which will give evidence as to the possibility of the relative resistance to strain between this type of plate and the lapped plate. In our opinion, the butt plate, such as is shown on this plan, will under all conditions of service stand up materially longer than a lapped plate because the stresses which take place are on the bolt, whereas with the lapped plate that stress is on the insulated bushing.

Mr. Dunham: Plan 1258 does not indicate how much the butt plate for insulating gage plate will stand above the base of the rail. I have in mind that this will be an obstruction, and objectionable on that account.

Mr. Patenall: If you will refer to the two drawings shown below you will get a very fair idea as to the comparative height of the plate, taking the rail into consideration. I should say offhand that two inches above the top of the tie would be a maximum height for that butt. It depends on the thickness of the plate. We are considering the use of ¾-in. plate and that may increase the height. Whatever it is, it will only be sufficient to get the bolts and nuts clear. I understand that 2⅜ in. is the maximum dimension over all.

C. A. Christofferson (N. P.): Anything that stands above the track, between the rails, is very objectionable. We have been using lapped plates, and have had some in

use for eight or ten years. I watched the insulation of that plate very carefully, and cannot see any wear on the insulation, nor can I see any reason why there should be wear on it, if the gage plate is properly fastened to the tie with lag screws. As to the front rod, it seems to me it would be a better plan to make the fastening for the lock rod down closer to the point, in order to get both of the ends the same length. I do not think there is any need of having any rod or rod piece. That means these rods each have to have a longer lock rod fastened in the center of the track.

J. Beaumont (I. C. C.): One year ago we changed from the vertical switch rod to the flat rod, and it was done for the purpose of securing more ample clearances and a higher degree of strength against track obstructions on trains. If this rod is placed on edge it will necessitate providing approximately three inches clearance below the rails in order to keep No. 1 rod clear at the ground. While that may not seem to be a serious matter, to my mind it means more clearance to meet this standard successfully under operating conditions than to provide for the flat rods. A rod of this kind, set on edge, is more easily bent by track obstructions.

Caleb Drake (C. & N. W.): I would like to disagree with Mr. Dunham's statement as to the adjustable rail brace lasting over a period of years. It is my experience that a ¾-in. rail brace on heavy traffic might better be figured in months. I think the committee ought to be encouraged in the investigation of adjustable rails.

Mr. Morrison: I might say for Mr. Dunham's information that we have used the tie plate as shown on this plan for a number of years, and have not experienced any difficulty on account of men stumbling over it, or its being struck by dragging equipment.

Mr. Dunham: I am perfectly willing to agree to this: that those wrought-iron or steel braces may last only a comparatively short time, but whether that enters the problem is not the real objection to the adjustable rail brace problem. The main reason that men have felt that they require an adjustable rail brace comes about from the fact that a wrought-iron or steel brace is not sufficiently rigid to maintain the track at the original gage, and for that reason adjustments are sought. I think the committee would do very well to ascertain what the practice is on our railways before suggesting the use of an adjustable rail brace.

Reverting to the insulated gage plate, shown in plan number 1258, I am very sure there is a substantial objection to an obstruction 2⅜ in. in height being placed between the rails as indicated. The Northern Pacific are using an insulated gage plate or lock joint riveted together. Gage plates so insulated have been in use for a period of eight or ten years with entire satisfaction. That sort of construction is not objectionable, and it is economical.

Mr. Stradling: I believe the lapped joint to the gage plate would stand probably 1½ in. or more above the base of the rail. It looks to me that we could frame it so as to turn this insulation upside down and have it out of the way. With regard to the adjustable rail brace, I feel you would either have to have an adjustable rail brace or an adjustable head rod to take care of the wear, and the adjustable rail brace has the feature of introducing more parts probably than a solid rail brace.

Report of Committee XIII—Electrical Testing

THE COMMITTEE PRESENTED drawing 1422, Adjustable Resistance for Testing, and asked that it be given consideration at the March meeting with a view of having it approved at the next annual meeting for submission to letter ballot.

Due to the obvious difficulty of drawing a specification of practical value for an adjustable resistance for testing purposes, the designs of which may vary so widely, the committee decided that a drawing should be prepared for this subject; this design is for practically all general testing purposes. The drawing is in sufficient detail and specific, so that the instrument may be purchased in the open market by reference to the drawing. Drawing 1422 was prepared with this end in view. Suggestions from manufacturers of similar apparatus, with reference to a number of details were followed by the committee. Several instruments, which were made in practical accord with this drawing, have given very satisfactory service.

Committee: P. M. Gault (I. C.), chairman; C. Drake (C. & N. W.), vice-chairman; M. A. Baird (Erie), H. Combs (L. E. & W.), C. A. Cotton (A. T. & S. F.), C. E. Earhart (A. & V.), T. Holt (Penna. Lines West), E. E. Ireland (C. I. & L.), G. W. Kydd (B. & O.), F. D. Morehart (C. M. & St. P.), T. J. O'Meara (N. Y. C.), D. W. Rosenzweig (So. Pac.), C. O. Seifert (B. & O.), C. F. Smith (U. P.), W. N. Spangler (P. R. R.), C. G. Stecher (C. & N. W.), L. L. Whitcomb (N. Y. C.).

Discussion

Chairman Gault presented an outline of the report and moved that it be presented to the annual meeting for submission to letter ballot.

L. R. Mann (M. P.): I notice the dimensions of this adjustable resistance are given at 13.5 in. over all. One that we have been using you can stick in your pocket. The idea of having a small one that can be carried in that way is good. Did the committee go into the matter of small resistances?

F. P. Patenall (B. & O.): I ask whether these resistances can be purchased in the open market?

Mr. Gault: It was not made primarily for convenience in carrying, but as a testing instrument, if it were made smaller, it would be found impossible to get the necessary tubes on the inside.

R. E. Trout (Frisco): I am wondering how the committee came to suggest making the drop-away 500 on slot coils of a 1000-ohms resistance. I have in mind with this type of resistance shunt it would be necessary to cut off part of the cells of the operating battery. Would it be possible to have the instrument so you could insert enough resistance to avoid doing this?

Mr. Gault: In the lower right-hand corner you will find a diagram which shows the method of wiring.

Mr. Trout: I had in mind a series resistance with the circuit in the shunt on the battery. In a great many cases the battery feeds not only the slot coil in which you are making the test, but the mine relay in the rear.

E. G. Stradling (C. I. & L.): Referring to the diagram in the corner, it would appear you first have 60 ohms on your theoretical resistance, and then you move your switch and add 50 more, giving 110, and your next step would be an additional 100, so you have those steps in between 150 and 110.

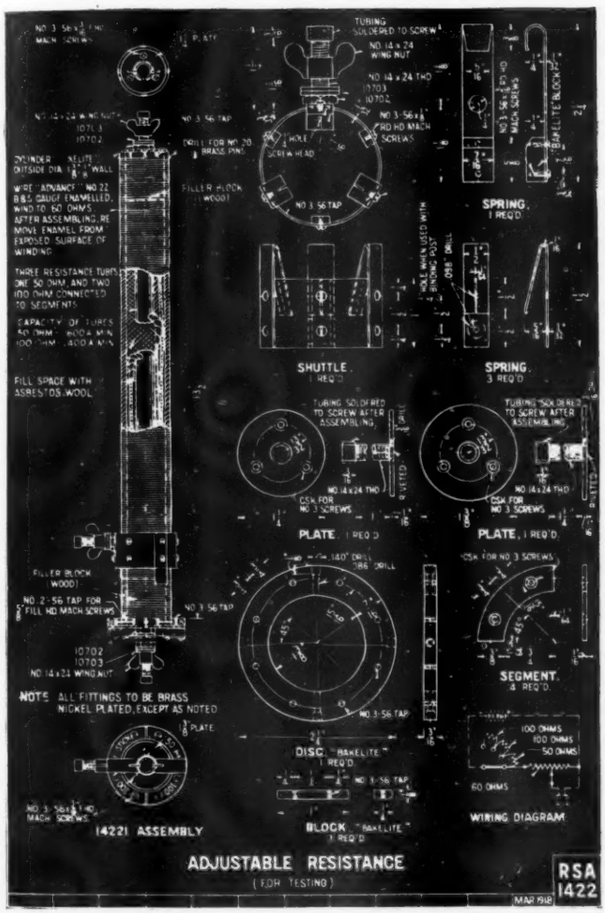
Mr. Gault: Simply by moving the slide back in the tube you can get successive steps up to 350 ohms.

T. S. Stevens (Santa Fe): I do not think we have had quite enough information from the committee as to the necessity for as large a resistance as this. I would

like to ask the committee if that is the smallest practicable resistance, or if it is the best, whether something smaller could be designed which could be used by men other than regular inspectors?

Mr. Gault: There may be smaller tubes which would be satisfactory for the particular checks, such as a maintainer having only one type of product would require, but the committee did not think it would be of any use to design an instrument that could not be used by the general inspectors on any railroad.

R. W. Irwin (Nat. Carbon Co.): According to this wiring diagram, you cannot get any resistance between 210 and 250; in other words, the first two of the resistance tubes on the inner side must not be larger than



Details of the Resistance Unit

the resistance on the coil wire on the outside in order to get continuous resistance.

L. R. Mann (M. P.): I believe it would be possible to get any resistance or any carrying capacity in a much smaller space. The long tube, instead of being straight, can be in a circle.

R. B. Arnold (C. & N. W.): As to the covering of the wire to protect it from mechanical injury. The resistance units are put in tool boxes on motor cars and might be easily injured. I believe that a covering of some sort could be put over that tube and a sliding contact extended out through a slot so that you can move the slide back and forth and get it in the same working condition and still have protection to the wire.

C. W. Burrows (Bureau of Standards): I had not intended to take any part in this discussion, but I do not feel that I should sit here without raising my voice in protest against the adoption of this report. There are a number of things that I consider the Association ought not to stand for. One is the fact that resistance is not continuous. You cannot get resistance between 110 and 150.

These units, which are mounted within the tube, are carefully filled in with insulating material so as to prevent the current from going out as much as possible. Asbestos wool is about as good an insulator and as poor a heat conductor as could be obtained. Furthermore, the cylinder is wound on bakelite, and while it is true bakelite is not a definite term, and there are a number of different qualities of bakelite, they are all non-conductors of heat.

Advance wire has been specified. Advance wire is a trade name. They might have specified several other wires which are also trade names. They might have specified constantin. I have taken a number of pieces of apparatus in which constantin was specified and put in Advance, and it was substantially the same.

I think the experience of the people who are manufacturing these rheostats should be taken into consideration. During the last week I have bought 15 slide wire rheostats, and the insulating wires are wound with nichrome. It might be interesting to say just a word about these rheostats I speak of. They represent the result of considerable study both in this country and abroad, and commercial experience in this country and abroad running back over maybe 20 years, and the wire is wound on a copper tube, covered with a burnt enamel, which gives perfect insulation and good conducting power.

There may be a few other points, but I have not tabulated them, and the criticisms I have made are those that occur to me as I look at this report. I think it would be much wiser for the Association to refer this matter of a rheostat back to the committee, rather than to go on record as favoring a design which we know could be improved.

Mr. Gault: In regard to this tube, it may appear to be perfectly heat insulated, but your committee took this identical tube and tested it to its marked capacity for, I believe, three hours, and it heated very slowly.

In regard to the trade names mentioned, Advance wire and bakelite, your committee went into the specifications for that wire at quite some length, and the wire that was best suited for the manufacture, in our estimation, was a wire called Advance wire. I may be wrong, but I don't believe that is a patent wire. Bakelite, while a more or less general term as commonly applied to signals on railroads, is rather definite. It was necessary to have some kind of a support for the wire that would not warp and get out of shape in the rain, and would stand a reasonable amount of rough usage.

In regard to the continuity of the resistance, I don't believe that you will have any difficulty in making tests for proper resistance on that tube. There is a small gap between 110 and 140, and another one between 210 and 240. I don't believe the men that tried the tube had any difficulty on that account.

Mr. Patenall: The resistance unit presented here is more for the specific purpose of being handled by an inspector whose duty it is to do nothing else but make inspections. I have to agree with Mr. Stevens that a smaller instrument might be of service for the use of repairmen, certainly one not as expensive.

Mr. Gault: I do not agree that this could not be generally used on railroads. The committee had no specific instructions to design a tube for one particular use. We therefore took it for granted you wanted something that could be used for any purpose. There could be

modifications made and parts of this tube omitted if you wished to make a cheaper tube. This is a practical unit and I cannot see any reason why we should not at least give it a trial.

Mr. Hawkins: There has been a lot of criticism as to not being able to get an adjustment between 110 and 150. Maybe the committee would be willing to adopt a slip, whereby they could slip over on the end and get that adjustment.

The President: The committee is willing to accept that suggestion. With this last acceptance I put the motion as to drawing 1422.

(The motion was defeated.)

The President: I will ask the committee to take the suggestion and criticisms that have been made on this subject and bring in a report at the next meeting.

The committee was excused with the thanks of the Association.

Report of Committee II—Mechanical Interlocking

THE COMMITTEE PRESENTED a report to the March meeting on unit specifications for painting interlocking machines, block signals and apparatus and materials used in connection therewith, with request that same be given consideration.

1. GENERAL.—All material must be of highest quality, and unadulterated. When request is made by purchaser, samples of mixed paint or its ingredients proposed for use shall be furnished for laboratory analysis.

2. MATERIAL.—Paints must conform to the purchaser's formulas and requirements when so specified, otherwise the best recognized practice shall be conformed to.

3. COMPOSITION.—The paint must consist solely of oil, gums, drier and pigment, in proper proportions, by weight.

4. VOLATILE MATTER.—The volatile matter must not exceed 5 per cent of the weight of the paint.

5. OIL.—The oil must be pure, raw linseed oil.

6. DRIER.—The drier must consist of a pure turpentine drier, free from benzine mineral oils and resins, and must be mixable with linseed oil without curdling.

7. PIGMENT.—The pigment must be so finely ground that when thumbnail test is applied, no feeling of grittiness shall be apparent.

8. COLOR.—The shade of the paint must conform strictly to the purchaser's specification.

9. DRYING.—Paint must dry so that next coat can be applied at expiration of 48 hours.

10. REJECTION.—Paint failing to meet the above requirements will be rejected. Where inspection is made at destination, shipment will be returned to the manufacturer, who must pay freight charges in both directions.

Shop Painting

11. CLEANING.—(a) Outside iron connections, switch and signal fittings, not machine finished, also signal mast, both inside and out, before shipment from works, shall be thoroughly cleansed and given either a priming brush or dipping coat of red oxide or graphite paint.

(b) Machine finished surfaces, before shipment or before being exposed to the open air, shall be coated with white lead and tallow or the equivalent, in the form of a thick coat of paste which will have sufficient body and firmness to resist weather and prevent rusting, and will readily wipe off with cotton waste.

Field Painting

12. CLEANING.—Surfaces shall be thoroughly cleaned so that all loose or easily detachable mill scale, rust, grease and dirt or other foreign substances are removed before paint is applied.

13. APPLICATION.—(a) Paint shall be well mixed, uniformly applied, thoroughly worked into all joints or open spaces, and each coat must be thoroughly dry before the application of the succeeding coat.

(b) Surfaces to be painted which will be inaccessible after erection must be given two coats before being assembled.

(c) Paint shall not be applied to outside surfaces in freezing weather, nor to wet surfaces.

(d) Priming coats shall be applied as soon as is consistent with the progress of the work.

(e) Finishing coats shall be applied in sufficient time for same to be dry when the installation is completed.

14. IRON WORK.—(a) Iron work (except interlocking machine, detector bars, gauge plates, iron foundation piers), not galvanized, shall be painted one priming coat and two finishing coats. Galvanized iron pipe shall be painted at threads, pipe rivets and wherever galvanizing is damaged.

(b) The following specific finishing coats shall be used:

	Color
Signal bridges and brackets	
Signal masts	
Dwarf signals	
All connections	

15. MACHINE.—(a) Machines shall receive one priming and one finishing coat as follows:

	Color
Machine from top of lever shoe to foundation supports, except finished part	
Lever above shoes, except finished parts of latch handles	
Block and interlocking mechanical signal	
Block and interlocking power signal	
Distant mechanical signal	
Distant power signal	
Dwarf signal	
Switch	
M. P. frogs	
Switch and lock	
Facing point lock	
Mechanical and electrical bolt lock	
Check lock	
Crossing gate	
Hand release	

(b) Sufficient varnish to be mixed with last coat to produce a good gloss finish.

16. WOODWORK.—(a) Woodwork, such as junction, relay, bell, cable, battery boxes and closets, also trunking

and capping, shall be given one priming coat and finishing coats as follows:

Color	Number of Coats
.....	.....
.....	.....
.....	.....
.....	.....

(b) Inside of trunking shall not be painted.

17. BUILDING.—Interlocking stations and other buildings shall be painted as follows:

Color	Number of Coats
.....	.....
.....	.....
.....	.....
.....	.....

Committee: C. J. Kelloway (A. C. L.), chairman; F. E. Whitcomb (B. & A.), vice-chairman; Samuel Miskelly (C. R. I. & P.), vice-chairman; G. W. Chappell (N. Y. N. H. & H.), C. S. Foster (P. R. R.), Oswald Frantzen (N. Y. N. H. & H.), G. W. McClelland (P. & R.), W. B. Morrison (D. L. & W.), Chas. Stephens (C. & O.), J. I. Vernon (N. Y. N. H. & H.), G. N. MacDougald (Virginian Ry.), E. K. Post (P. R. R.), R. W. Taylor (B. & O.), E. J. Relph (N. P.), Larsen Brown (A. T. & S. F.), Wm. Dawson (N. Y. C.), E. C. Carrol (C. & N W.), E. E. Mack (C. & E. I.), W. F. Zane (C. B. & Q.), H. F. Lomas (I. C. R. R.), F. E. Jacobs (C. & W. I.).

Discussion

Vice-Chairman F. E. Whitcomb outlined the assignments of the committee and presented the report on subject 6 for submission to letter ballot.

F. B. Wiegand (N. Y. C.): I suggest the elimination of the words "proposed for use" in the third line.

Mr. Whitcomb: The committee will accept that change.

L. F. Howard (U. S. & S. Co.): In paragraph 7 that test for pigment I understand will procure a pigment which is practically of the same degree of fineness which is used in painting carriages and automobiles. I want to call attention to that so as to be sure there is no misunderstanding as to quality.

Mr. Wiegand: I would like to suggest a change in number 12, cleaning, "Surfaces must be thoroughly cleaned and all loose or easily detachable mill scale, rust, grease and dirt, oil or other foreign substances removed before paint is applied."

Mr. Whitcomb: I will accept that.

J. A. Peabody (C. & N. W.): If what has been stated is true relative to pigment, it seems to me that is a question that should be thoroughly considered before we adopt it, because here is a place where we certainly can save money, if any place. We do not need any such pigment as that for the protection of signal poles and relay poles.

Mr. Whitcomb: The idea was this, to have a pigment test that could be readily applied. All these other tests most anybody can apply.

Mr. Peabody: If that has not been looked into, I think it should be, because it means a considerable cost.

Mr. Whitcomb: This was taken up pretty thoroughly by the committee with the structural engineers, and I don't think there was any one of them that objected to it.

F. P. Patenall (B. & O.): From the explanation given by Mr. Howard, I would think the committee is exactly right. If there is any place you can waste money on a railroad, it is in buying bad paint. I believe the committee ought to adhere pretty closely to what it has stated in its specifications.

C. Drake (C. & N. W.): I think it should be left optional in section 16, as to whether cedar trunking and capping should be painted.

Mr. Whitcomb: There is no objection whether you want to paint any of this trunking or not.

Mr. Drake: I understood this trunking and capping should be given one priming coat and finishing coat.

The President: The committee will accept the suggestion and arrange it so that that paragraph will be optional. There being no objection, these specifications will be presented to the annual convention for approval and submission to letter ballot for insertion in the manual.

Report of Committee XI—Batteries and Switchboards

IN REVISING DIRECTIONS for installation of storage batteries the committee presented for preliminary discussion and criticism directions for installation of lead type stationary storage battery, which if adopted will replace obsolete material now in the Manual.

Now that this type of battery is being used to a considerable extent in place of the gravity battery, the expensive installation of a battery well or chute does not appear to be warranted. It is felt by the committee that better inspection and maintenance can be secured by the use of a box and that in most cases a material reduction of original cost will also be effected.

In revising specifications for soda primary battery and arranging with Committee VI for preparation of plan for 1000 A. H. primary battery jars, the committee is considering the revision of drawing 1043, R. S. A. Signal Cell, so as to eliminate the porcelain jar and to provide in its place a round jar for the new 1000 A. H. cells.

The committee desired to have a discussion and expression of opinion on the following questions:

1. In addition to the round jars, should the standard drawing provide additional 500 A. H. and 1000 A. H. jars of a different shape?

2. If so, should such jars be rectangular or square, i. e., should it design a new square jar of these two sizes which will admit the use of both the round and plate type elements or should it follow the present design of rectangular jars which are in use on a number of roads and which use the same rectangular cover for both sizes of jar?

3. Should a solution line similar to the electrolyte line in the storage battery jar be provided with primary battery jars?

4. How close to the top of the jar is it advisable to bring the solution, bearing in mind the serious results which may be caused by spilling the solution in handling the jars in and out of battery chutes or wells?

Directions for Installation of Lead Type Stationary Storage Battery

1. HOUSING.—(a) Battery should be isolated in a room or box, as the acid fumes given off during charge

are of a corrosive nature. This space should be well ventilated and lighted, and as dry as practicable.

(b) Inside of housing should contain no exposed metal work other than lead. If this is not practicable, such metal parts should be protected by at least two coats of acid-proof paint.

(c) Floor of battery room should be sloped, to provide proper drainage.

(d) Floor shall be preferably of vitrified brick, joined with pitch.

2. SUPPORTS.—Batteries should be supported on wooden racks or shelves of sufficient strength to prevent sagging or placed on layer of sand on floor of battery box. They should be arranged so as to permit access for inspection and cleaning and for the removing of any cell or element.

3. ERECTION.—(a) Fill the sand trays level with top with clean, dry sand, space trays uniformly on support so as not to touch the adjacent trays.

(b) Clean the jars and press them into sand until they have solid bearing and are in proper alignment.

(c) Scrape the contact surfaces of connecting straps of elements to insure good electrical connection.

(d) Place a positive and a negative group inside each jar in such a manner that the positive and negative plates will alternate with the two end plates negative. Arrange the groups so that the positive group of one cell will connect with a negative group of the adjacent cell. Straighten the plate lugs to prevent them from touching each other.

(e) Bolt the connecting straps together with the bolt connectors, making each connection tight. Connect rows of cells with lead tape or rubber-covered copper wire. Cover all bolt connectors and exposed copper with vaseline.

(f) Connect the charging circuit wires to the battery terminals with the positive wire of the charging circuit connected to the positive or dark brown element terminal.

(g) Before proceeding inspect all connections carefully to insure that they are tight and properly made, positive to negative; be sure that the charging current at proper voltage and under control is available and that the initial charge can be started immediately and can be continued to its completion.

(h) Unpack the wooden separator parts, which include wooden sheets and dowels. Insert the sheets into the dowels, with the grain of the sheets crosswise to the grain of the dowels. Place the separators between adjacent positive and negative plates with the dowels vertical. Place the glass hold-down in position on each cell.

(i) Immediately after separators are placed in position the cells should be filled with electrolyte to a height of three-quarters (¾) of an inch above the tops of the plates or to the electrolyte line. The electrolyte should be of 1.210 specific gravity at 70 degrees Fahr., in accordance with R. S. A. specification.

(j) The initial charge must be started immediately after the electrolyte has been added to the cells.

4. INITIAL CHARGE.—(a) The initial charge should take from 40 to 60 hours at the normal charging rate, and should not be interrupted until the charge is complete, unless the temperature of the electrolyte exceeds 110 degrees Fahr. In this event, stop charging until the battery cools.

(b) Adjust the charging current to the normal eight-hour charging rate and maintain this value throughout the charge. Readings should be taken on every cell with a low reading voltmeter immediately after starting the charge, to insure that all the connections are properly made, positive to negative, and that no short circuits exist.

(c) At half-hour intervals during the course of the charge, read the battery voltage and also the specific gravity of one or two selected cells. The voltage and specific gravity should rise as the charge progresses, and near the end of charge, each should have reached maximum value. Continue to charge for three hours after the maximum values have been reached. At the end of the charge, all the cells should be gassing freely and the specific gravity of the electrolyte in every cell should be stationary.

(d) If, at the end of charge, the electrolyte is not at 1.210 specific gravity at 70 degrees Fahr., it should be adjusted to this value, at the proper height above the plates.

(e) To raise the specific gravity, electrolyte of a higher density, or, if this is not available, electrolyte of 1.210 specific gravity should be added before next charge. To lower specific gravity, water should be added. If necessary, remove a part of the solution from battery before adding electrolyte or water.

(f) Water used in batteries should either be distilled or from a source which has been tested and approved for storage battery use.

(g) As the cells give off hydrogen during charge, an open flame should not be permitted near battery.

Committee: R. B. Elsworth (N. Y. C.), chairman; A. B. Himes (B. & O.), vice-chairman; J. G. Bartell (L. V.), G. E. Beck (N. Y. C.), W. E. Boland (So. Pac.), E. G. Hawkins (N. Y. C.), W. H. Higgins (C. R. R. of N. J.), J. F. Jacobs (C. R. R. of N. J.), T. L. Johnson (D. L. & W.), S. J. Knowlton (P. R. R.), A. H. McKeen (O. W. R. & N.), L. F. Viellard (L. I.), C. O. Warner (N. Y. N. H. & H.), A. H. Yocum (P. & R.).

Discussion

(Vice-Chairman Himes called attention by number to the outline covering the directions for the installation of lead type stationary storage battery, asking for criticisms as each item was brought up for discussion. He brought out that the battery manufacturers had complained of the word "pitch" being used for joints, in vitrified brick floors, claiming that it hardens and will crack out. He stated that the committee has agreed to accept the criticism.)

T. S. Stevens (Santa Fe): Why not R. S. A. petroleum asphaltum? That won't harden and it is being used a great deal now.

Mr. Himes: The committee will accept Mr. Stevens' suggestion and look into the petroleum asphaltum.

Mr. Wiegand: I would like to refer to paragraph G of 3, erection. It says, "before proceeding," and I was wondering if that was before proceeding with the erection or proceeding with the charge.

Mr. Patenall: Proceeding needs correction.

Mr. Himes: The committee will change the wording of paragraph 3-G, as suggested.

Mr. Wiegand: In 3-H we speak of wooden separator parts; in 3-I we speak of separators. I was wondering if the same term could not be used in both paragraphs?

Mr. Himes: It hardly seems necessary after referring in paragraph 3-H to wooden separator parts which, of course, we know consist of the veneer and the pins, and so forth, supporting it, to repeat again the word "parts" in the following paragraph.

Mr. Wiegand: I think that word "parts" could be eliminated from H and have the paragraph read, "wooden separators."

The President: The committee will accept that suggestion.

H. M. Beck (Elec. Stor. Bat. Co.): Under number

one the statement is made that "battery should be isolated in a room or box." This is correct with the open type batteries, but there is a type of cells that is being put on the market which is intended to be used without a separate battery room, and on that account it would be a little more accurate if these directions were so changed as to refer to batteries of the unsealed or open type.

Upon the question of the use of pitch, which has been brought out, we have had some very sad experiences in our battery room with the use of compounds which are too brittle, where it is put in with the tile, especially if the temperature gets at all below normal, it not only chips, but it separates from the tile and allows the acid to go through to the foundation, to the concrete, and it attacks the concrete and causes a great deal of trouble. This is something which is very difficult to remedy after it has once occurred. On that account we try to pay particular attention to getting the right kind of compound at the start.

Number 3, under erection, Section A, specifies that sand trays should be filled with dry sand. I have found in going around not infrequently, ordinary building sand used for that purpose, and it is attacked by acids. I think that we usually specify what is known as bar sand or silica sand, which is not attacked by acid.

Section G, under 3: It is stated that the charge should start immediately after electrolyte is put in there. This is a wise precaution, but it is not necessary. There is no special harm results if a considerable period is allowed to elapse, and it is more convenient to handle it in this manner.

Number 4, initial charge A, states that this should not be interrupted until the charge is complete, unless the temperature of the electrolyte exceeds 110 deg. F. In this event, stop charging until the battery cools. I have often had cases where they have taken special pains to have men on the job and carry this on when it would take over 100 hr. In such cases it saves a good deal of time and trouble to interrupt a charge at night, and there is no injury results to the cells from doing so, if the charge is finally carried to the complete maximum.

That same section says that that charge will take from 40 to 60 hr. That is about right in round numbers, but it is much safer practice to go by the maximum load than by any fixed time, and therefore I would like to specify that the charge shall be continued to the maximum average of gravity, and for 10 hr. after the maximum has been reached.

With reference to Section D, it says that at the end of the charge the specific gravity shall be adjusted to 1.210. This again means a good deal of unnecessary labor, because it was quite an operation to adjust the specific gravity of a number of cells, 50 or more, to exactly the same point, and we find it is perfectly satisfactory to allow some leeway, and the practice of our construction department is to consider anything from 1.205 to 1.215 as perfectly satisfactory.

T. S. Stevens: I want to endorse what Mr. Beck has said as representing very clearly the Santa Fe practice, particularly about 4 (f). We work to the maximum without any specific time of charging at all, and in order to insure that we get that, after certain limited time, perhaps ½ hr. during the charge, instead of using 4 (c) we take the specific gravity of each cell until the charge is complete, and we know then that each cell has had its proper charge.

I should think it inadvisable to begin to adjust the electrolyte at the end of the charge. You do not know what subsequent charges are going to do to your electrolyte. It may be after a 10-hr. maximum you have not done the job, until you discharge the batteries, and possibly discharge it twice, and you find that the specific gravity goes up, and you find you adjust the gravity, only to have to reduce it again. Mr. Beck is right in the fact that we have no need to work to 1.210 specific gravity.

R. B. Arnold (C. & N. W.): With reference to paragraph (h) on page 23, I believe it would be well to have some construction of that paragraph to take care of wooden separators after they have been unpacked and before they are inserted into the battery with electrolyte in and left in that condition over night, as sometimes occurs. I have found wooden separators on top of the box after they have been left over night, in some cases are dried out so that they are not good for further use.

Under paragraph (e) on page 24, I think that the best practice is to add water before the charge is begun in order to have the water thoroughly circulated with the acid, but I do not figure it good practice, if you wish to raise the specific gravity of the electrolyte to add electrolyte. I think that is an instruction of the battery companies, which is not good practice, that after you put in your density of acid, which you wish to specify, and then you find that the electrolyte has gone down in density, that you can remedy it by adding density to increase the specific gravity.

Mr. Himes: The committee will consider the point brought out by Mr. Beck, and present a report covering these items at the next meeting.

(A motion that the specifications as here revised be submitted to the annual meeting for approval and submission to letter ballot for insertion in the manual was carried.)

Mr. Himes: Subject 6 is entitled, "Revise specification for soda primary battery and arrange with Committee VI for preparation of plan for 1000-a. h. primary battery jars."

Mr. Patenall: I would think to provide a rectangular jar for the 500-a. h. battery might result in making the application of setting up of the battery a little more compact than our present receptacle. On the other hand, I want to have the committee tell me why it should be necessary to have two types of jars when I can get nearly all the service I want out of one type. Of course, the same argument would apply with the 1000-a. h. cell. I understand some railways insist that for the 1000-a. h. battery they get either a square or a rectangular top jar. I think the committee should be rather careful in making recommendations in that direction.

Mr. Himes: The committee has not made any recommendation that we adopt any other size or shape of jar, but for some time past several railroads throughout the country have been using the 500-a. h. rectangular jar cell, and, as stated by Mr. Patenall, two or three companies have demanded square or rectangular jars for the 1000-amp. cell. Does the Association desire us to draw specifications for a square or rectangular jar, and will they use all elements and specify they shall be in square or rectangular jars and thus cut down the number of standards?

Mr. Trout: It seems to me it would be inadvisable to design a square or rectangular jar. Possibly it would not take care of the different types of design.

Mr. Erwin: Referring to what Mr. Patenall said, I believe the manufacturers would be delighted if we had only one type of jar and one type of cell. We want to get what the railroads wish, but it would be much easier for us if we had to give only one thing.

(The motion made by Mr. Himes, that the rounded jar only is desirable as a standard, was put to vote and carried.)

Report of Committee X—Signaling Practice

THE COMMITTEE SUBMITTED reports on the following subjects:

Report on the problem of signaling single-track roads with reference to the effect of signaling and proper location of passing sidings on the capacity of the line.

Report on the feasibility of separating into distinct types of their own, the signals for train operation, and the markers or signs which indicate the location or position, or both, of information signs and switch signs for conveying information to trainmen and design suitable day and night (if necessary) markers or signs for switches, derailing switches, stop signs, slow signs, resume speed signs, water station and trackpan markers, highway crossing signs, etc.

Follow developments of automatic train control devices and report regarding such as comply with the A. R. A. requirements.

The Problem of Signaling Single-Track Roads

Further work on this subject was done in applying and testing formulas and methods on pieces of roads and the committee presented an analysis of the effect of passing track location on eighty-eight miles of line.

The analysis of this line is simple, due to the fact that there are no large yards or junction points and that it is used exclusively for freight service. The traffic consists almost entirely of solid tonnage trains between yards at South Pekin and Benld. The running time of these trains as used on sheets 1, 2 and 3 was obtained by computation from the tractive efforts of the locomotives in use, with their full theoretical tonnage for ruling grades. By the use of this method uniform results are obtained which are not possible when taking actual figures obtained by riding trains, unless the average of a large number are obtained, and the speed and time of a train at any point can be found, which is of considerable advantage in locating new passing tracks. These figures are checked by train dispatchers, and by actual figures obtained by riding several trains.

Sheet 1 is an analysis using all the present passing tracks with their present capacity. In this and succeeding analyses the stop for water north of Womac made by all southward trains is not necessary for locomotive requirements, but is made according to rule to relieve the water station at Benld.

It must be remembered that the minimum time between trains is determined by finding the maximum sum of schedules between passing sidings as shown in column K, sheets 1, 2, 3 and 5.

In using all the present passing tracks there are cases where they are so close together that the delayed time is large. Certain of these tracks can be left out and still maintain the same minimum time between trains (it may be advantageous to do this even though the minimum is increased slightly), with a decrease in the delayed time to southward trains waiting for meeting. On sheet 2 is shown an analysis using only the passing sidings which can be used to best advantage in eliminating delayed time.

Sheet 3 shows the schedule as worked out under the proposed rearrangement. In this rearrangement the following existing tracks are to be extended to 100-cars capacity, the direction of the extension being that to give the best balance of time, due consideration being given to grade, curve, highway crossings, bridges and other conditions affecting passing track location. Green Valley, Allen, Luther, Hubly, Sweetwater, Barr, Siding No. 2, Archer, Lick, Lemmon, Girard and Womac. Three new passing sidings of 100-cars capacity are proposed at Brando, Mile Post 7¼ and Mile Post 94¾. In addition, Benld Yard lead should be extended north into Gillespie interlocking plant, Luther passing track south into Luther interlocking plant, Lick water station moved south to the coal chute with a penstock installed between main and passing track, and a penstock similarly installed at the water station at Lemmon. This will require a total of 7.92 miles of track, but will release 2.33 miles of track at Compro, Virden and Siding No. 3, now used for passing sidings.

Sheet 5 shows a comparison of the sum of the schedules between adjacent passing sidings and the delayed time to southward trains waiting for meeting, as obtained from columns K and L of sheets 1, 2 and 3.

Sheet 6 shows a comparison of the capacity of main track under the different arrangements shown on sheets 1, 2 and 3, giving in an easy comparble form the essential features and results which may be expected from the proposed rearrangement. All figures are based on the assumption that when operating at full capacity each train will meet an opposing train at each passing siding.

The committee recommended that the matter on the capacity of single track be accepted, and printed in the Proceedings as information.

Separating into Types Signals for Train Operation

In the investigation of this subject, the committee developed the following:

Some of the so-called signs govern train operation just as much as the movable semaphore of an interlocking or block signal system and these signs are recognized in the Standard Code of the American Railway Association as signals. See note to the definition of fixed signals, page 235, Rule Book of the American Railway Association, January, 1916, reading as follows:

"The definition of a 'Fixed Signal' covers such signals as slow boards, stop boards, yard limits, switch, train order, block, interlocking, semaphore, disc, ball or other means for displaying indications that govern the movement of a train."

Under this definition stop boards, slow boards, etc., are in fact signals. Work was confined to designing the signs that fall under the above definition and those that are closely related to them, namely, those that convey instructions to an engineman, although they may not "govern the *movement of a train.*"

As a guide to the work, inquiries were sent out to all railroads represented in the A. R. E. A. Standard plans were received from 43 roads and these were tabulated as to type, painting, etc.

Designs were submitted for the following signs:

1. Stop.
2. Speed limit or slow.
3. Resume speed.
4. Yard limit.
5. Station one mile.
6. Yard one mile.
7. Junction one mile.
8. Crossing one mile.
9. Draw one mile.
10. Highway crossing whistle post.
11. Flanger sign.

SOUTH PEKIN TO BENLD

ANALYSIS OF CAPACITY OF MAIN TRACK
WITH PRESENT ARRANGEMENT "A" OF PASSING SIDINGS

	Capacity of Passing Tracks	South A	South B	South C	North D	North E	North F	S&N G	South H	South I	North J	S&N K	L
				A+B			D+E	C+F		C+H	F	I+J	105-K
		Running Time	Coal & Water	Schedule Time - No Meeting	Running Time	Coal & Water	Schedule Time	Sum of Schedules N & S	Meeting Time	Schedule Meeting All Sidings	Schedule	Sum of Schedules	Delay Waiting for Meeting
South Pekin	Yd.	19		19	21		21	40		29	21	50	0
Green Valley	75	19		19	20		20	39	10/10	39	20	59	46
Allen	75	19	W 10	29	21		21	50	10/10	44	21	65	40
Luther	75	14		14	19	W 10	29	43	10/10	34	29	63	42
Hubly	75	20		20	15		15	35	10/10	40	15	55	50
Sweetwater	79	16		16	17		17	33		36	17	53	52
Culver													
Barr	75	12		12	18		18	30	10/10	32	18	50	55
Tower "BX"													
Siding No. 2	81	31		31	38		38	69	10/10	51	38	89	16
Bando													
Archer	75	20	C&W 20	40	25		25	65	10/10	60	25	85	20
Lick	75	17		17	17	C&W 20	37	54	10/10	32	37	69	36
Compro	83	12		12	12		12	24	10/10	32	12	44	61
Lemmon	69	5		5	5		5	10	10/10	25	5	30	75
Virden	75	13		13	15		15	28	10/10	33	15	48	57
Girard	75	34	W 10	44	41		41	85		64	41	105 Max	0
M C.Conn.													
Womac	85	15		15	16		16	31	10/10	35	16	51	54
Siding No. 3	62	23		23	25		25	48	10/10	33	25	58	0
Tower "ON"													
Benld	Yd												
Totals		289	40	329	315	30	355	684	290	619	355	974	604

C = Coal
W = Water

SHEET 1 OF 6 SHEETS

SOUTH PEKIN TO BENLD

ANALYSIS OF CAPACITY OF MAIN TRACK
WITH PRESENT ARRANGEMENT "B" OF PASSING SIDINGS.

	Capacity of Passing Tracks	South A	South B	South C	North D	North E	North F	S&N G	South H	South I	North J	S&N K	L
				A+B			D+E	C+F		C+H	F	I+J	K-S
		Running Time	Coal & Water	Schedule Time - No Meeting	Running Time	Coal & Water	Schedule Time	Sum of Schedules N & S	Meeting Time	Schedule Meeting All Sidings	Schedule	Sum of Schedules	Delay Waiting for Meeting
South Pekin	Yd.	19		19	21		21	40	10/10	29	21	50	0
Green Valley	75												
Allen		33	W 10	48	41		41	89	10/10	63	41	104	1
Luther	75								10/10				
Hubly		34		34	34	W 10	44	78		54	44	98	7
Sweetwater	79								10/10				
Culver													
Barr		28		28	35		35	63		48	35	83	22
Tower "BX"													
Siding No. 2	81								10/10				
Bando		31		31	38		38	69		51	38	89	16
Archer	75								10/10				
		20	C&W 20	40	25		25	65		60	25	85	20
Lick	75								10/10				
Compro		29		29	29	C&W 20	49	78		44	49	93	12
Lemmon	69								10/10				
Virden		18		18	20		20	38		38	20	58	47
Girard	75								10/10				
M C.Conn.		34	W 10	44	41		41	85		64	41	105 Max	0
Womac	85								10/10				
Siding No. 3		38		38	41		41	79		48	41	89	0
Tower "ON"									—				
Benld	Yd												
TOTALS		289	40	329	325	30	355	684	170	499	355	854	125

C = Coal.
W = Water.

SHEET 2 OF 6 SHEETS

SOUTH PEKIN TO BENLD

ANALYSIS OF CAPACITY OF MAIN TRACK
WITH PROPOSED ARRANGEMENT OF PASSING SIDINGS

	South A	South B	South C	North D	North E	North F	N&S G	South H	South I	North J	N&S K	L
			A+B			D+E	C+F		C+H	F	I+J	63-K
	Running Time	Coal Water	Schedule Time - No Meeting	Running Time	Coal Water	Schedule Time	Sum of Schedules N & S	Meeting Time Including Meet at each Intermediate Station	Schedule Meeting All Sidings	Schedule	Sum of Schedules	Delay Waiting for Meeting
South Pekin	20		20	22		22	42	10/10	30	22	52	0
Green Valley	19		19	20		20	39	10/10	39	20	59	4
Allen	18	W 10	28	20		20	48	10/10	48	20	68 Max	0
Luther	14		14	19	W 10	29	43	10/10	34	29	63 Max	0
Hubly	20		20	15		15	35	10/10	40	15	55	8
Sweetwater	16		16	17		17	33	10/10	36	17	53	10
Culver												
Barr	12		12	18		18	30	10/10	32	18	50	13
Tower BX												
Siding No. 2	15		15	19		19	34	10/10	35	19	54	9
Bando	16		16	20		20	36	10/10	36	20	56	7
Archer	19		19	24		24	43	10/10	39	24	63 Max	0
Lick	11	C&W 10	21	12	C&W 15	27	48	10/10	36	27	63 Max	0
M.P 74¼												
Compro	19		19	19		19	38	10/10	39	19	58	5
Lemmon												
Virden	18		18	20		20	38		30	20	58	5
Girard								10/10				
M.C.Conn.	19		19	23		23	42		39	23	62	1
M P 94¾								10/10				
	15	W 10	25	18		18	43	10/10	45	18	63 Max	0
Womac												
Siding No. 3	23		23	24		24	47	—	33	24	57	0
Tower ON												
	15		15	15		15	30	—	15	15	30	0
Benld												
Totals	289	30	319	325	25	350	669	290	609	350	959	62

C = Coal.
W Water.

SHEET 3 OF 6 SHEETS

SOUTH PEKIN TO BENLD

COMPARISON OF SUM OF SCHEDULES
AND DELAY TO TRAINS WAITING FOR MEETING.

	Present A		Present B		Proposed	
	Using all sidings with trains that will clear on shortest siding		Using sidings to best advantage with trains that will clear on said sidings		Using all sidings as per list	
	K	L	K	L	K	L
	Sum of Schedules	Delay waiting for meeting	Sum of Schedules	Delay waiting for meeting	Sum of Schedules	Delay waiting for meeting
South Pekin	50	0	50	0	52	0
Green Valley	59	46	104	1	59	4
Allen	65	40			63 Max	0
Luther	63	42	98	7	63 Max	0
Hubly	55	50			55	8
Sweetwater	53	52	83	22	53	10
Culver						
Barr	50	55			50	13
Tower "BX"						
Siding No. 2	89	16	89	16	54	9
Bando					56	7
Archer	85	20	85	20	63 Max	0
Lick	69	36	93	12	63 Max	0
M.P 74¼					58	5
Compro	44	61				
Lemmon	30	75	58	47	58	5
Virden	48	57				
Girard					62	1
Macoupin County Conn.	105 Max.	0	105 Max.	0		
M P 94¾					63 Max.	0
Womac	51	54	89	0	57	0
Siding No. 3	58	0			30	0
Tower "ON"						
Benld						
Totals	974	604	854	125	959	62

Present, column A, taken from sheet 1.
Present, column B, " " " 2.
Proposed column taken from sheet 3.

SHEET 5 OF 6 SHEETS

Data for Analysis of Track Capacity

The committee was not ready to report on the switch target, derail sign and trackpan sign and there may be others, although most if not all of the other signs come under the general heading of information signs.

It was recommended that all of the information signs, such as trespass signs, section limits, right-of-way limits, city limits, end of double track, etc., be of such shape as not to conflict with the designs submitted.

Where a preliminary sign not covered by the designs submitted is needed in the rear of an information sign, it was recommended that it be made in the same form and general character as signs numbered 5 to 9.

For stop, speed-limit, and resume-speed signs (which affect all trains), the committee followed the semaphore type and generally accepted aspects. For signs 4 to 9, inclusive, it was not practicable to follow the semaphore type and, in these cases, it was considered that the object to be accomplished was the greatest visibility and distinguishability as to form. For signs 10 and 11, the signs in present use vary widely but the variations do

SOUTH PEKIN TO BENLD

COMPARISON OF CAPACITY OF MAIN TRACK WITH VARIOUS ARRANGEMENTS OF PASSING TRACKS

			Delay to Southward Train in Minutes = Sum of differences between the maximum and each individual sum of schedules to and from adjacent stations, it being considered that trains are so dispatched that there is no delayed time at terminal. (See Sheet 5)	Maximum sum of schedules to and from adjacent stations, including time entering and leaving sidings (See Sheet 5)	Number of trains on road at one time	Schedules in Minutes		Theoretical Capacity in Trains per day, Including Passenger	Freight Trains		Freight Cars	
						Southward-Delays not included	Northward-		Theoretical Capacity per day	Relative Capacity	Theoretical Capacity per day	Relative Capacity
PRESENT	A.	Using all siding with trains that will clear on shortest siding. (69 Cars)	15	374	604	619	355	27	27	100%	1863	100%
	B.	Using sidings which can be used to best advantage in eliminating delayed time and trains that will clear on said sidings. (69 Cars) Sidings used Green Valley, Luther, Sweetwater, Siding No 2, Archer, Lick, Lemmon Girard, Womac.	10	854	125	499	355	27	27	100%	1863	100%
PROPOSED		Proposed extension of passing sidings at Green Valley, Allen, Luther, Hubly, Sweetwater, Barr, Siding No. 2, Archer, Lick, Lemmon, Girard and Womac. New passing sidings at Benld M.P. 74½; and M.P. 94½. All to be 100 car capacity. Extension of Benld Yard Lead North into "ON" Interlocking Plant and Luther passing siding South into Luther Interlocking Plant. Move Lick Water Station south to Coal Chute, and install Re-stock between Main and Passing Tracks. To be followed by Automatic Signals.	17	959	62	609	359	45	45	167%	4500	242%

1863 Cars — Present "A"
1869 Cars — Present "B"
4600 Cars — Proposed.

SHEET 6 OF 6 SHEETS

Graphical Representation of Car Capacity

Data for Analysis of Track Capacity

not appear to be material. Designs were submitted conforming to signs that are in quite general use.

It was thought that the limitations of restricted clearances were so varied that it was hardly practicable to design a sign to meet all conditions and it was therefore suggested that the designs submitted could be modified to meet the requirements of each case. Sketches were drawn up to indicate how the designs submitted could be modified to fit track spacing of thirteen feet without encroaching on the clearance limits recommended by the A. R. E. A.

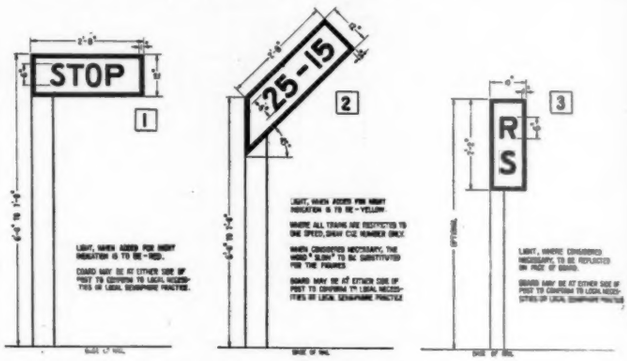
In the designs the committee confined themselves to outlines and did not undertake to specify materials from which the signs may be constructed.

No recommendations were made as to standard location of these signs. This appears to be an important matter and one in which uniformity is essential. On this point the committee asked for further instructions.

The committee recommended that the above matter be submitted to letter ballot.

Developments of Automatic Train Control Devices

On this subject, the committee had not learned of



Proposed Standard Signs

anything new of which they might make a report. As an aid to those taking up the subject, it is desirable the following data in regard to classification of devices and reports of official tests made by the Block Signal and Train Control Board and by the Bureau of Safety, Interstate Commerce Commission of train control devices, be given as information.

The train control devices that have been tested and those that have been developed to the extent that models have been made or patents issued may be divided into the following classes or type:

1. Mechanical trip.
2. Electric contact rail.
3. Insulated track rail.
4. Magnetic inductive.
5. Inductive.
6. Hertzian wave or wireless.

Devices Tested

ROWELL-POTTER SAFETY STOP.—This included an automatic signal system, with signals operated by power stored by a passing train, and a mechanically operated train stop.

Tested on the C. B. & Q., near Aurora, Illinois, between December, 1908, and May, 1909. Report of test published in second annual report of Block Signal and Train Control Board.

HARRINGTON TRAIN CONTROL AND ALARM.—An overhead mechanical trip, and audible cab signal.

Tested on Erie, near Englewood, N. J., between January, 1910, and May, 1910. Report of test published in third annual report of Block Signal and Train Control Board.

LACROIX TRAIN CONTROL SYSTEM.—An automatic stop and cab signal system of the intermittent contact rail type.

Tested on Staten Island Rapid Transit, between March and May, 1911. Report of test published in fourth annual report of Block Signal and Train Control Board.

WARTHEN CAB SIGNAL AND TRAIN CONTROL SYSTEM.—A cab signal and automatic train stop of the intermittent overhead contact type.

Tested on the B. R. & P., near Rochester, N. Y., in April, 1911. Report not published.

RAILWAY AUTOMATIC SAFETY APPLIANCE CO.—An automatic stop device, of the mechanical trip type, controlled electrically.

Tested on the Pere Marquette, near Saginaw, Mich., between March and May, 1911. Report of tests published in fifth annual report of Block Signal and Train Control Board.

JONES SIGNAL SYSTEM.—An automatic train stop of the mechanical trip type, electrically controlled.

Tested on the New York Central, near La Salle, N. Y., in March, 1913. Report not published.

GRAY-THURBER TRAIN CONTROL SYSTEM.—An automatic train control system using a short section of insulated track and an insulated portion of the train.

Tested on the P. Ft. W. & C., near Pittsburgh, in June, July and December, 1912. Also from April to July, 1914. Report published as part of the report of the Chief of Division of Safety, Interstate Commerce Commission for 1914, as House Document 1482, 63rd Congress, 3rd Session.

AMERICAN TRAIN CONTROL CO.—An automatic train control system of the intermittent electrical contact type.

Tested on the Maryland & Pennsylvania, near Baltimore, in November and December, 1914. Report of tests published as House Document 1541, 63rd Congress, 3rd Session.

GOLLOS RAILWAY SIGNAL COMPANY.—An automatic train control system of the intermittent elecric contact type.

Tested on the C. B. & Q., near Aurora, Ill., from August to October, 1915, and from February to April, 1916. Report of tests published as House Document 1192, 64th Congress, 1st Session.

WOODING TRAIN CONTROL SYSTEM.—An automatic train control system of the intermittent electric contact type.

Tested on the D. L. & W., between Hoboken, N. J., and Newark, in May and June, 1915, and from January to April, 1917. Report of tests published as House Document 251, 65th Congress, 1st Session.

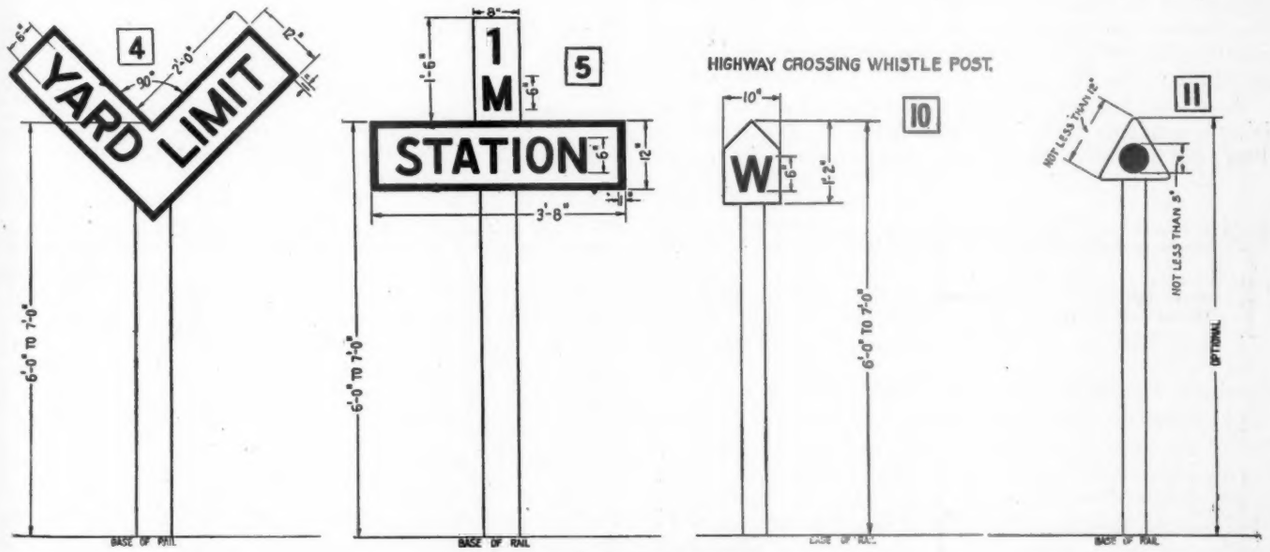
The committee recommended that the above matter on automatic train control be accepted, and presented to the association as information.

Committee: J. A. Peabody (C. & N. W.), chairman; W. J. Eck (Sou. Ry.), vice-chairman; C. C. Anthony, H. S. Balliet (N. Y. C.), C. A. Christofferson (N. P.), C. E. Denney (N. Y. C. & St. L.), C. A. Dunham (G. N.), W. H. Elliott (N. Y. C.), G. E. Ellis (I. C. C.), J. V. Hanna (K. C. Term. Co.), J. G. M. Leisenring (I. T. S.), H. K. Lowry (C. R. I. & P.), J. C. Mock (M. C.), F. P. Patenall (B. & O.), A. H. Rudd (P. R. R.), W. B. Scott (S. P. Ry.), T. S. Stevens (A. T. & S. F.), B. Wheelwright (G. T.).

Discussion

J. A. Peabody, Chairman, read the preliminary printed portion of the report, and said:

Wtih regard to paragraph 2, report on the problem of signaling single-track roads with reference to the effect of signaling and proper location of passing sidings on the capacity of the line, I want to take this opportunity of calling your attention to the analysis of location of sidings on single-track lines. We did some work on our road, and in the case of the first piece of track we tried this on I guaranteed our superintendent we would increase the capacity 65 per cent. That was without the signals at all. The traffic conditions have changed on that piece of track so that we have not had to use the capacity fully, but we really obtained wonderful results. Trains are going over the line in a way they never did before, but, of course, we have the signals, as well as relocated passing tracks and longer passing tracks, which all go toward accomplishing this effect.



Proposed Standard Signs

At this time, when it is going to be so necessary for all of us to increase the capacity of our lines with the least amount of labor and material, I believe it is especially necessary that we should go into this subject. I know one other signal engineer who was called on to pass on the question of the capacity of a line, and what could be done with it, as against building a cut-off line, which was supposed to be necessary, in which case he convinced the officials that the cut-off was not necessary, and with the passing tracks properly located, they have more than the necessary capacity for many years to come.

We hope to go on with this work also in connection with double track as well as single track, and I am convinced there is a large amount of work along that line that can be done. I do not know of any department of the railroad better qualified to go at it than the signal department.

I move that this part of our report be accepted as information.

(Motion put and carried.)

Mr. Peabody then read paragraph 6 and said:

We have presented a series of designs which we offer, and recommend that they be submitted to the annual convention for presentation to letter ballot. I so move.

Caleb Drake (C. & N. W.): Should not these designs show the thickness of the material?

Mr. Peabody: I do not think that is at all necessary. They can be designed of various materials.

Mr. Peabody then read paragraph 10.

The President: This general subject is now open for discussion.

Mr. Gault: I think there should be some distinction in the shape between signs requiring a stop and those merely for information.

J. C. Mock (M. C.): A train does not have to stop because the sign is put up and says one mile to the junction. That is information to the engineer.

The President: It has been moved and seconded that the signs or markers shown be accepted for presentation to the annual meeting for approval and submission to letter ballot for insertion in the manual.

(Motion carried.)

The report of the committee was accepted, and the committee was excused with the thanks of the Association.

Report of Committee XVI—Harmonizing of Specifications

THE FOLLOWING OUTLINE of work has been assigned this committee:

1. Harmonize and make complete in accord with accepted standards the wording and requirements of specifications and subject matter desirable or as assigned by the Editing committee.

2. Any matter affecting a committee must be approved by the chairman of said committee before presentation to the Association. The committee desires to report progress, and calls the attention of the Association members to the following:

At a joint meeting of the Editing committee, Harmonizing committee and Committee VIII, on November 9, 1917, the sections and paragraphs at variance in the reports of both the Harmonizing committee and Committee VIII, as submitted at the convention in Atlantic City, were harmonized satisfactorily to the members of these committees.

Committee: F. B. Wiegand (N. Y. C.), chairman; H. S. Balliet (N. Y. C.), G. H. Dryden (B. & O.), W. H. Elliott (N. Y. C.), R. B. Elsworth (N. Y. C.), P. M. Gault (I C.), E. G. Hawkins (N. Y. C.), R. C. Johnson (B. R. T.), C. J. Kelloway (A. C. L.), L. R. Mann (Mo. Pac.), C. H. Morrison (N. Y. N. H. & H.), F. P. Patenall (B. & O.), J. A. Peabody (C. & N. W.), E. G. Stradling (C. I. & L.).

Discussion

This report was received as information and the committee excused with the thanks of the Association.

Report of Committee VIII—A. C. Automatic Block Signaling

THE COMMITTEE SUBMITTED A NEW SET of specifications to cover a. c. motor semaphore signals. These specifications are divided into 21 different headings which cover the various phases of motor semaphore signals as follows:

(1) Requisite sheet (information for same), (2) alternative proposal, (3) mechanism housing, (4) joints in masts, (5) semaphore spectacle, (6) roundels, (7) operating, connection, mechanical, at base of mast; (8) bearings, (9) semaphore shaft, (10) mechanism, (11) circuit controller, (12) wiring, (13) motor, (14) hold clear device, (15) dielectric tests, (16) insulation, (17) inspection, (18) packing, (19) marking, (20) tests, (21) requisite sheet.

Committee: C. H. Morrison (N. Y. N. H. & H.), chairman; H. K. Lowry (C. R. I. & P.), vice-chairman; F. J. Ackerman (K. C. Term.), B. T. Anderson (D. L. & W.), J. A. Beoddy (N. & W.), J. D. Elder (M. C.), W. F. Follett (N. Y. N. H. & H.), E. C. Grant (U. P.), R. C. Johnson (B. R. T.), J. B. Lamb (Southern), H. G. Morgan (I. C.), W. W. Morrison (N. Y. C.), G. H. Packwood (St. L. M. Ry.), L. V. Parle (S. P.), E. B. Smith (N. Y. C.), F. C. Stuart (E. J. & E.), G. K. Thomas (A. T. & S. F.), L. F. Vieillard (L. I.), F. E. Wass (N. Y. C.), Edgar Winans (A. T. & S. F.), G. H. Wion (Vic. Gov'm't Ry.), Leroy Wyant (C. R. I. & P.), B. F. Oler (P. R. R.).

Discussion

C. H. Morrison, Chairman: Since submitting this report the committee has held three meetings, and in reviewing the specification, as submitted, has deemed it advisable to introduce several changes and begs leave to postpone action on this specification until the next meeting, when it will be re-submitted.

The President: Unless there is some objection, the request of the committee will be acceded to.

Mr. Morrison: The specifications we have submitted, with a few exceptions, were prepared by a committee of eight last year. Unfortunately the sub-committee turned over to the committee of eight the completed specification too late to submit at the annual meeting. It includes not only the mechanism, but the entire signal. On account of the signal mechanism being so closely associated with the design of the signal mast, it was necessary to include in the specification for the mechanism the mast. For instance, there is the question of housing of the mechanism in case it is placed at the face of the pole; the method of operation between the mechanism and shaft and spectacle in case the mechanism is placed at the top of the pole. We gave the instructions given to us by the Committee on Committees very careful consideration, and owing to the fact that the specification was almost complete, we deemed it advisable, on account of the close association of other parts of the signal to the mechanism, to include in the specification the signal mast parts.

The President: This matter will be referred to the Committee on Committees.

Canadian Pacific Meeting at the Coliseum

Among the early arrivals at the Coliseum yesterday morning were E. Keough, assistant engineer maintenance of way, Canadian Pacific, with 13 roadmasters from as many different divisions on the eastern lines of that road. This is the third year Mr. Keough has brought a similar party to the exhibit. As one-third of the roadmasters on the line have attended the exhibit each year, all of those on the eastern lines have now had an opportunity to visit Chicago and study the display at the Coliseum.

Corporate and Operating Expenses Separate

(From our Washington Correspondent)

Director-General of Railroads McAdoo issued a circular yesterday ordering that after April 1 expenses of railroad offices at New York or elsewhere, devoted to financial and corporate matters as distinguished from operating matters, must cease to be charged against operating expenses, except as expressly authorized by him. This is taken to indicate that all financial and corporate, as distinguished from operating expenses, will be required in time to be paid by the railroad companies from the guarantees made to them by the Government.

Special Meeting of Committe No. 8, R. S. A.

The chairman of Committee 8, on A. C. Automatic Block Signaling, announced that a special meeting of that comimttee will be held in Room 401 of the Auditorium Hotel at 2:30 p. m. today.

N. R. A. A. Annual Meeting

The National Railway Appliances Association will hold its annual meeting and election of officers in the Coliseum at eleven o'clock this morning. The reports of the retiring officers will be presented and other necessary business transacted.

Union Pacific Men Go to Washington

E. E. Adams, consulting engineer of the Union Pacific, and F. W. Sercombe, assistant controller, with headquarters at New York, have been appointed assistants to R. S. Lovett, director of the Division of Capital Expenditures on the staff of the director-general at Washington.

A. N. Talbot Heads New U. S. Construction Division

A. N. Talbot, professor of civil engineering at the University of Illinois and chairman of the special committee of the American Railway Engineering Association on Stresses in Track, has been appointed chairman of the newly created construction division in the war department to carry on the immense building program of the government, involving an expenditure of over one billion dollars and the employment of hundreds of thousands of workmen. This is a recognition of Professor Talbot's ability which will be welcomed by his many friends among the members of the Engineering Association. Professor Talbot was also elected president of the American Society of Civil Engineers at its annual meeting held in New York in January.

The Material Situation

The Western Society of Engineers has prepared a special program for a meeting to be held in its rooms in the Monadnock Block this evening. The subject for consideration will be the material problem as it affects engineers. The conditions in the structural steel plants will be described by F. J. Llewellyn, division contract manager of the American Bridge Company. The situation in the lumber industry will be described by Hermann Von Schrenk, consulting timber engineer, St. Louis, Mo., while the conditions in the Portland Cement Industry will be outlined by B. F. Affleck, president of the Portland Cement Association. A special invitation is extended to the members of the American Railway Engineering Association to attend this meeting and to participate in the discussion of this topic which is of so much concern to engineers at the present time.

A. R. E. A. Board of Direction Meets

The Board of Direction of the American Railway Engineering Association met in the English Room of the Congress Hotel yesterday forenoon to complete plans for the convention and make preparations for the coming year. Fourteen members were present.

No June Meeting of Railway Signal Association

The Board of Direction of the Railway Signal Association has announced that no stated meeting of that association will be held in New York this year, but that this meeting will be consolidated with the annual convention which will be held in September as usual.

Wood Preservers' Meeting

The Executive committee of the American Wood Preservers' Association will meet at the Sherman Hotel at 6:30 this evening to formulate plans for the year's work. In view of the unsettled conditions in the industry, a number of important problems will be presented for consideration.

Movies of the Tie Tamper

The Ingersoll-Rand Company presented a moving picture film of its pneumatic tie tamper in action in the Green room at the Congress Hotel at 5:30 yesterday afternoon. This program will be repeated at the same hour this afternoon and at 12:30 on Thursday. All railway men are invited to see this film and to observe tie tampers in action.

The Roadmasters Meet

A meeting of the Executive committee of the Roadmasters' and Maintenance of Way Association will be held at the Auditorium Hotel this evening. The taking over of the operation of the railroads by the government has created a number of problems for this Association which will be discussed at this meeting and the course of procedure outlined.

The President's Annual Dinner

J. G. Sullivan, president of the American Railway Engineering Association, gave a dinner in the English Room of the Congress Hotel last evening to the members of the Board of Direction and the Committee on Arrangements. These dinners have become an annual event through a custom which has been followed for a number of years. The number attending the dinner last night was somewhat larger than in the year previous, a hopeful indication of the attendance at the convention.

On the Union Pacific

(A Jap section foreman reports.)

To your letter will answer. Bull and calf way up high on hill, no find no feed on hill, come down on track. Calf come, too, by wagon crossing same time on crossing same time come No. 9. Don't know time but time was dark. Calf run. Bull get hit. Bull broke into cannot skin.

U. Tomie.

Railway Signal Association Registration

Ackerman, F. J., Supt. Construction, Sig. Dept., Kansas City Terminal Ry., Union Station, Kansas City, Mo.
Ambach, E. T., Asst. Supt. Tel. & Sigs., B. & O. S. W. R. R., Room 212, Central Union Depot, Cincinnati, Ohio.
Anderson, B. T., Asst. Sig. Engr., D. L. & W. R. R., Hoboken, N. J.
Arnold, R. B., Engr., Sig. Engr's Office, C. & N. W. Ry., 5702 Washington Blvd., Chicago, Ill.
Ashley, Robin D., Sig. Inspr., I. C. R. R., Central Sta., Chicago, Ill.
Bagley, F. H., Asst. Sig. Engr., L. & N. R. R., Room 805, L. & N. Bldg., Louisville, Ky.
Balliet, H. S., Asst. Term. Mgr., Grand Central Terminal, Room 1612, G. C. T. Bldg., New York, N. Y.
Beaumont, J., Sen. Tel. & Tel. Engr., Valuation Board, I. C. C., Karpen Bldg., Chicago, Ill.
Beck, Geo. E., Asst. Sig. Engr., Val., N. Y. C. R. R., West of Buffalo, Cleveland, Ohio.
Beoddy, J. A., Gen. Sig. Inspr., N. & W. Ry., Roanoke, Va.
Black, E. A., Sig. Supr., N. Y. C. R. R., West of Buffalo, 118 Prospect St., Ashtabula, Ohio.
Bradley, E. E., Sig. and Tel. Engr., Western Maryland R. R., Hagerstown, Md.
Breecher, A. T., Sig. Supr., C., M. & St. P. Ry., Box 705, Savanna, Ill.
Brown, Larsen, Senior Asst. Sig. Engr., A., T. & S. F. Ry., Topeka, Kan.
Burrows, C. W., Associate Physicist, Bureau of Standards, Washington, D. C.
Butridge, J. H., Chf. Sig. Inspr., I. C. R. R., 12th St. Station, Chicago, Ill.
Byers, Dwight, Sig. Inspr., N. Y. C. R. R., West of Buffalo, 9501 Cedar Ave., Cleveland, Ohio.
Caley, Glenn H., Elec. and Sig. Engr., N. Y. O. & W. Ry., Middletown, N. Y.
Carrol, E. C., Supt. Sig. Constr., C. & N. W. Ry., Room 404, C. & N. W. Term., Chicago, Ill.
Carroll, W. D., Sig. Supr., B. & O. R. R., Pittsburgh, Pa.
Christofferson, C. A., Sig. Engr., Nor. Pac. Ry., St. Paul, Minn.
Clark, A. C., Chf. Clerk to Sig. Engr., Erie R. R., Jersey City, N. J.
Conway, C. J., Sig. Engr., Detroit United Rys., 82½ Tireman Ave., Detroit, Mich.
Cormick, James H., Director, Sig. Engr., Can. Nor. Ry., Union Sta., Winnipeg, Man.
Cowherd, G. R., Sig. Engr., E. P. & S. W. Ry., Room 704, Southwestern Bldg., El Paso, Texas.
Cronk, C. D., Asst. Sig. Engr., N. Y. C. R. R., West of Buffalo, Cleveland, Ohio.
De Meritt, E. B., Asst. Engr., Central of Georgia Ry., Savannah, Ga.
Denney, C. E., Asst. to Pres., N. Y. C. & St. L. R. R., Cleveland, Ohio.
Dickinson, B. F., Supr. Sigs., P. R. R., Harrisburg, Pa.
Drake, Caleb, Gen. Sig. Inspr., C. & N. W. Ry., Room 1007, 223 Jackson Blvd., Chicago, Ill.
Dryden, G. H., Prin. Asst. Sig. Engr., B. & O. R. R., Baltimore, Md.
Dryden, W. L., Sig. Supr., S. I. R. T. Ry., St. George, S. I., N. Y.
Duffy, C. M., Act. Asst. Engr., C., R. I. & P. Ry., El Reno, Okla.
Dunham, Chas. A., Past President, Sig. Engr., Great Northern Ry., St. Paul, Minn.
Earhart, C. E., Sig. Engr., A. & V. R. R., Vicksburg, Miss.
Elliott, W .H., President, Sig. Engr., N. Y. C. R. R., East of Buffalo, Albany, N. Y.
Ellis, G. E., Div. of Safety, I. C. C., Washington, D. C.
Finch, J. C., Inspr. Sigs., Mo. Pac. Ry., Room 1084, Railway Exchange Bldg., St. Louis, Mo.
Foale, H. J., Sig. Engr., Wabash Ry., Decatur, Ill.
Ford, F. A., Supr. Sigs., C. & O. Ry., Hinton, W. Va.
Foster, Franklin C., Sig. Supr., L. & N., Evansville, Ind.
Frantzen, Oswald, Supr. Sigs., N. Y., N. H. & H. R. R., Room 458, South Sta., Boston, Mass.
Frazee, A. M., Elec. Engr., D., M. & N. Ry., 401 Wolvin Bldg., Duluth, Minn.
Fugina, A. R., Sig. Engr., L. & N. R. R., Louisville, Ky.
Garrobrant, J. R.
Gault, Paul M., Office Engr., Sig. Dept., Ill. Cent. R. R., Room 900, Ill. Cent. Sta., Chicago, Ill.
Gillan, I. F., Sig. Supr., C., M. & St. P. Ry., Union Depot, Milwaukee, Wis.
Green, R. E., Asst., Sig. Engr., M. C. R. R., Third St. Depot, Detroit, Mich.
Haag, H. F., Chf. Draftsman, Kansas City Southern Ry. Co., 510 K. C. S. Bldg., Kansas City, Mo.
Hanert, Wm. A., Draftsman, Lines Com., N. Y. C. R. R., 891 Stanley Ave., Detroit, Mich.
Hawkins, E. G., Power Engr., N. Y. C. R. R., East of Buffalo, Albany, N. Y.
Hayes, M. M., Asst. Supr. Sigs., N. Y. C. R. R., East of Buffalo, Room 307, N. Y. C. Depot, Rochester, N. Y.
Hiles, Wm., Inspr. of Sigs., C., C., C. and St. L. Ry., Cincinnati, Ohio.
Himes, A. B., Asst. Engr., Sig. Dept., B. & O. R. R., Baltimore, Md.
Hix, A. P., Director, Sig. Engr., T. R. R. Assn. of St. L. and St. L. M. B. T. Ry. Co., Union Sta., St. Louis, Mo.
Hobson, Harry, Sig. Supr., A., T. & S. F. Ry., Topeka, Kan.
Hodgdon, C. R., Sig. Engr., Can. Pac. Ry., Winnipeg, Man.
Hoffman, S. C., Sig. Inspr., I. C. R. R. Co., 616 Term Sta., Memphis, Tenn.
Hossman, Wm. R., Constr. Sig. For., K. C. Term. Ry., Room 216, Union Sta., Kansas City, Mo.
Hough, W. A., Sig. Draftsman, Erie R. R., 117 Park Ave., Paterson, N. J.
Kearton, W., Sig. Engr., Minn. R. R. & Warehouse Com., St. Paul, Minn.
Kellenberger, K. E., Editor, "The Railway Signal Engineer," Transportation Bldg., Chicago, Ill.
Kilian, H. L., Supr. Sigs., N. Y. C. R. R., West of Buffalo, 748 Redwood Ave., Toledo, Ohio.
Lakin, F. D., Div. Engr., M. of W., Erie R. R., Meadville, Pa.
Lafferty, K., D. W. & P.
Law, Stanley W., Asst. Sig. Engr., Nor. Pac. Ry., St. Paul, Minn.
Lee, Frank, Engr. M. of W., Can. Pac. Ry., Montreal, Que.
Leisenring, John, Sig. Engr., Illinois Traction Co., Springfield, Ill.
Lowry, H. K., Sig. Engr., C., R. I. & P. Ry., 813 La Salle Street Station, Chicago, Ill.
Mac Kay, W. M., Relay Inspr., Sig. Dept., N. Y. C. R. R., West of Buffalo, Cleveland, Ohio.
Mann, L. R., Director, Gen. Sig. Inspr., Mo. Pac. Ry., 7tth and Poplar Sts., St. Louis, Mo.
Meisel, Benjamin W., Asst. Eng., Sig. Dept., C. & N. W. Ry., 546 N. Humphrey Ave., Oak Park, Ill.
Miskelly, Samuel, Asst. Sig. Engr., C., R. I. & P. Ry., La Salle St. Station, Chicago, Ill.
Mock, J. C., Sig. & Elec. Engr., M. C. R. R., Detroit, Mich.
Morehart, Forrest D., Draftsman, C. M. & St. P. Ry., care of Sig. Engr.'s Office, Milwaukee Shops, Wis.
Morgan, H. G., Sig. Engr., I. C. R. R., Room 900, Cen. Sta., Chicago, Ill.
Morrison, C. H., Sig. Engr., N. Y., N. H. & H. R. R., New Haven, Conn.
Munthe, A., Office Engr., Nor. Pac. Ry., 884 Mound St., St. Paul, Minn.
O'Laughlin, W. M., Sen. Sig. Engr., I. C. C., 914 Karpen Bldg, Chicago, Ill.
Oppelt, J. H., Sig. Supr., N. Y., C. & St. L. R. R., 524 Columbia Bldg., Cleveland, O.
Orr, H. H., Sig. Engr., C. & E. I. R. R., 6600 Union Ave., Chicago, Ill.
Packwood, G. Horatio, Jr., Sig. Engr., St. Louis Municipal Ry., Room 310, City Hall, St. Louis, Mo.
Parnell, Loy, Sig. Inspr., Wabash Ry., Montpelier, O.
Patenall, F. P., Sig. Engr., B. & O. R. R., Baltimore, Md.
Peabody, J. A., Sig. Engr., C. & N. W. Ry., 215 Jackson Blvd., Chicago, Ill.
Phillips, J. D., Supr. of Sigs., P. & R. Ry., Reading, Pa.
Portier, L. B., Asst. Sig. Engr., C. M. & St. P. Ry., Milwaukee Shops, Wis.
Pratt, Alfred E., Supr. Sigs., Erie R. R., Marion, O.
Ragland, R. R., Sig. Supr., Mo. Pac. Ry., De Soto, Mo.
Rapelye, E. F. D.
Redgrave, Wm. B., Engr. M. of W., B. & O. R. R., 52 Wall St., New Brighton, S. I., N. Y.
Relph, E. J., Mech. Sig. Engr., Nor. Pac. Ry., St. Paul, Minn.
Rice, A. H., Director, Sig. Engr., D. & H. Co., 58 N. Pearl St., Albany, N. Y.
Robison, Harry O., Sig. Supr., Mo. Pac. Ry., Osawatomie, Kansas.
Schultz, E. E., Engr., Sig. Dept., C. & N. W. Ry., 2148 Berteau Ave., Chicago, Ill.
Scott, H. S.
Seaman, J. C., Chief Sig. Inspr., N. Y. C. R. R., West of Buffalo, 897 Evangeline Road, Cleveland, Ohio.
Seeburger, Francis F., Sig. Relay Inspr., C. M. & St. P. Ry., care of Asst. Sig. Engr., Tacoma, Wash.
Seifert, T. C., Sig. Inspr., C., B. & Q. R. R., Room 1400, 547 W. Jackson Blvd., Chicago, Ill.

Seymour, A. W., Office Engr. Maint. of Sigs., N. Y. C. R. R., East of Buffalo, Albany, N. Y.
Sharpley, H. F., Jr., Prin. Asst. Engr., Central of Georgia Ry., Savannah, Ga.
Sicht, J. C., Sig. Supr., Mo. Pac. Ry., 721 McLane St., Falls City, Neb.
Simmons, H. H., Business Mgr., "Ry. Maintenance Engr.," Transportation Bldg, Chicago, Ill.
Stevens, Thos. S., Past President, Sig. Engr., A., T. & S. F. System, Topeka, Kan.
Stoll, J. Geo., Sig. Supr., C., R. I. & P. Ry., Ft. Worth, Tex.
Stoltz, C. F., Sig. Engr., C., C., C. & St. L. Ry., 600 Big Four Bldg., Cincinnati, Ohio.
Storms, W. S., Chief Sig. Inspr., Erie R. R., Jersey City, N. J.
Stradling, E. G., Director, Sig. Engr., C. I. & L. Ry., Salem St. Office, La Fayette, Ind.
Stuart, F. C., Sig. Engr., E. J. & E. Ry., Joliet, Ill.
Sutherland, M., Supt. Sigs., Maine Central R. R., Brunswick, Me.
Tanton, W. F., Sig. Inspr., N. Y. C. R. R., East of Buffalo, Room 1612, G. C. T. Bldg., New York, N. Y.
Taylor, R. W., Asst. Sig. Engr., B. & O. R. R., Baltimore, Md.
Trout, Geo. W., Supt. Tel. & Sig. Engr., Pere Marquette Ry., Detroit, Mich.
Trout, R. E., Vice-President, Sig. Engr., Frisco System, 709 Frisco Bldg., Springfield, Mo.
Tyler, R. F., Gen. Sig. For., C., M. & St. P. Ry., Tacoma, Wash..
Wass, F. E., Supr. of Sigs., Grand Central Terminal, Room 1612, G. C. T. Bldg., New York, N. Y.
Whitcomb, Fred E., Director, Sig. Engr., B. & A. R. R., Boston, Mass.
Whitehorn, A. R., Estimator, Sig. Dept., I. C. R. R., Room 900, Central Sta., Chicago, Ill.
Wiegand, F. B., Sig. Engr., N. Y. C. R. R., West of Buffalo, Cleveland, Ohio.
Worthing, E. E., Sig. Engr., Sou. Pac. Lines, Atlantic System, Houston, Tex.
Yorke, F. R.
Young, J. V., Sig. Engr., B. & M. R. R., 213, Old Fitchburg Sta., Boston, Mass.

Junior Members

Allan, T. A., Sig. Inspr., Grand Trunk Ry., Room 514, Canadian Express Bldg., Montreal, Quebec.
Chevalier, H. W., Draftsman, Sig. Dept., C., M. & St. P. Ry., Milwaukee Shops, Wis.
French, Everett E., Sig. Maintr., C. & N. W. Ry., R. F. D. 4, Madison, Wis.
Hadlow, Walter R.
Hollway, M. A., Sig. Draftsman, N. Y. C. R. R., East of Buffalo, Rochester, N. Y.
Immekus, Carl, Sig. Draftsman, I. C. R. R., Room 900, Central Sta., Chicago, Ill.
Kautz, A. H., Pilot Engr., Office of Val. Engr., 136 Charles St., Mt. Oliver Sta., Pittsburgh, Pa.
Loudon, B.
Mills, C. E., Sig. Maintr., G. R. & I. R. R., 107½ Howard St., Petoskey, Mich.
Murphy, Thos. F.
Scheve, A. B., Sig. Draftsman, Western Maryland Ry., 301 Augusta Ave., Baltimore, Md.
Shaw, Elmer, Sig. For., C. & N. W. Ry., Des Plaines, Ill.
Van Osinski, H. M., Sig. Maintr., N. Y. C. & St. L. R. R., 442 Indiana Ave., Hammond, Ind.
Wevat, Alfred.

Associate Members

Ahrens, C. R., Sales Dept., Sig. Accessories Co., 30 Church St., New York, N. Y.
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Baker, Ray N., Rep., Central Electric Co., 320 So. Wells St., Chicago, Ill.
Beck, H. M., Engr., Electric Storage Battery Co., 1720 Marquette Bldg., Chicago, Ill.
Blackmore, Geo. A., Gen. Sales Mgr., Union Switch & Signal Co., 30 Church St., New York, N. Y.
Boylan, Thos. H., Inspr., Iowa R. R. Com., Des Moines, Ia.
Brown, E. W., Salesman, Thos. A. Edison, Inc., Primary Battery Div., 68 Amherst St., East Orange, N. J.
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Edmunds, Frank W., Sales Agt., Dressel Ry. Lamp Works, 3860 Park Ave., New York, N. Y.
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Fox, M. J., Rep., Railroad Supply Co., 203 S. Dearborn St., Chicago, Ill.
Garrity, P. A., Salesman, Thos. A. Edison, Inc., Primary Battery Div., 750 People's Gas Bldg., Chicago, Ill.
Gifford, H. E., Jr., Rep., A. G. A. Ry. Light & Sig. Co., 857 People's Gas Bldg., Chicago, Ill.
Hamilton, H. A., Sales Engr., The Okonite Co., 501 Fifth Ave., New York, N. Y.
Henry, W. S., Acting Res. Mgr., General Railway Signal Co., 30 Church St., New York, N. Y.
Henze, C. D. A., Res. Mgr., Federal Signal Co., 1129 Monadnock Block, Chicago, Ill.
Hines, B. F., Traveling Sales Engr., Thos. A. Edison, Inc., 30 Church St., New York, N. Y.
Hobson, J. S., Western Mgr., Union Switch & Signal Co., 917 People's Gas Bldg., Chicago, Ill.
Howard, L. Frederic, Chief Engr., Union Switch & Signal Co., Swissvale, Pa.
Hudson, E. E., Vice-Pres. & Gen. Mgr., Waterbury Battery Co., 30 Church St., New York, N. Y.
Hunt, H. E., Engr., Electric Storage Battery Co., 19th St. and Allegheny Ave., Philadelphia, Pa.
Jacobs, Harry M., Sig. Accessory Dept., General Electric Co., Schenectady, N. Y.
Jones, F. H., Asst. Res. Mgr., General Railway Signal Co., 1248 People's Gas Bldg., Chicago, Ill.
Kyle, W. T., Sales Agt., Page Steel & Wire Co., 30 Church St., New York, N. Y.
Lavarack, F. C., Gen. Sales Mgr., The Signal Accessories Co., 30 Church St., New York, N. Y.
Lepreau, F. J., Vice-Pres. & Div. Mgr., Thos. A. Edison, Inc., Primary Battery Div., 30 Church St., New York, N. Y.
Lorenz, J. M., Salesman, Central Electric Co., 4425 Ellis Ave., Chicago, Ill.
McGuiness, F. V., Mgr., Ry. Dept., Edison Storage Battery Co., Orange, N. J.
Manuel, W. N., Rep., Corning Glass Works, Corning, N. Y.
McCarthy, D. J., C. R. S. & S. Co.
McClintock, W. M., C. R. S. & S. Co.
Miller, P. W., Rep., Kerite Ins. Wire & Cable Co., 30 Church St., New York, N. Y.
Murray, Wm. B., Engr., Miller Train Control Corp., Danville, Ill.
Nelson, G. A., Spec. Rep., Waterbury Battery Co., 30 Church St., New York, N. Y.
Newcomb, E. W., Pacific Coast Rep., Thos. A. Edison, Inc., Primary Battery Div., 921 Crocker Bldg., San Francisco, Cal.
Reichard, W. H., Asst. Gen. Mgr., Fed. Sig. Co., Albany, N. Y.
Renton, Jos. A., Kerite Ins. Wire & Cable Co., 30 Church St., New York, N. Y.
Saunders, J. E., Asst. Chief Engr., Union Switch & Signal Co., Swissvale, Pa.
Sawyer, E. T., Sales Engr., Edison Storage Battery Co., Orange N. J.
Shaver, A. G., Cons. Elec. & Sig. Engr., Room 857 People's Gas Bldg., Chicago, Ill.
Sheene, Henry R., Res. Mgr., Union Switch & Signal Co., Ry. Exchange Bldg., St. Louis, Mo.
Simmen, P. J., Pres., Simmen Automatic Ry. Sig. Co., 1575 Niagara St., Buffalo, N. Y.
Spicer, V. K., Spec. Rep., Union Switch & Signal Co., People's Gas Bldg., Chicago, Ill.
Stewart, H. W., General Electric Co., Schenectady, N. Y.
Talbert, W. W., Resident Mgr., Union Switch & Signal Co., People's Gas Bldg., Chicago, Ill.
Thomas, L., Res. Mgr., General Railway Signal Co., 1248 People's Gas Bldg., Chicago, Ill.
Thompson, H. G., Vice-Pres., Edison Storage Battery Co., Orange, N. J.
Underhill, J. Delmar, Salesman, The Okonite Co., 501 Fifth Ave., New York, N. Y.
Van Steenburgh, W. R., Care of The Okonite Co., 501 Fifth Ave., New York, N. Y.
Vogel, E. W., Pres., Chicago Railway Signal & Supply Co., 754 People's Gas Bldg., Chicago, Ill.
Woodbridge, J. Lester, Elec. Stor. Batt. Co.
Waitt, Walter G., Asst. Factory Mgr., National Carbon Co., Cleveland, Ohio.
Ware, H. C., Sales Engr., Federal Signal Co., 1129-30 Monadnock Block, Chicago, Ill.
Whall, F. R., Gen. Mgr., C. H. Whall Co., 170 Summer St., Boston, Mass.
Young, J. W., Rep., Kerite Ins. Wire & Cable Co., 30 Church St., New York, N. Y.

The Railway Signal Association and the War

An Outline of the Activities of the Members in Military and Naval Work. A Number of Men Already in Active Service

MARSHAL JOFFRE called the present conflict a "railway war" as long ago as 1914. When the history of this war is written the railways of the world will no doubt receive proper credit for their important part in the conflict. The railway weapon, or "The Fifth Arm," as it has been called, will be one of the essential and determining factors for the winning of the war. Had it not been for the well organized railway systems of France at the time of the battle of the Marne, history might have had an entirely different story to chronicle. Germany, with all her vaunted efficiency, would have been utterly unable to make the showing she has to date were it not for her perfectly organized railway systems.

No army in the field, no matter how large or small, can fight unless the necessary supplies and equipment reaches it when needed. In this war there may be considered to be two general divisions: the fighting forces and the production forces. It is unnecessary to dwell upon the important part to be played by the production forces, as without the proper spirit and work of these forces the fighting division would be of little or no use. The connecting link between the two forces is the transportation unit. The breakdown of either one of the three units means catastrophe. With the transportation link as the unit connecting the other two it is plain to see what an important bearing this unit has upon the whole outcome of the war. Realizing the importance of this unit, all men engaged in transportation are bearing their share of the burden towards a victorious ending to the present conflict only when they do their utmost to facilitate the smooth operation of this machine.

In order to preserve an unbroken link in this unit from our country to the fighting line over 3,000 miles away it is necessary that the fighting division have numbered among its men experienced men in the transportation field in order to operate efficiently the military railroads that it is necessary to construct from the port of debarkation in France to our fighting lines. It was necessary that the railroads of our country furnish the men for this overseas duty. How nobly they have responded is common knowledge to all. The glorious part a small unit of these men took in the battle of the Cambrai is but an indication of what may be expected from them on a larger scale. These men have been selected from all classes of the service and all railroad organizations are no doubt represented by men in such service. In this connection the Railway Signal Association has had three of its standing committee members enter the service.

These members consist of Lieut. R. M. Phinney, who was formerly a member of committee No. 4—Direct Current Automatic Block Signaling; Capt. E. L. Adams, formerly vice-chairman of committee No. 9—Wires and Cables, and Capt. W. M. Vandersluis of committee No. 10—Signaling Practice. In addition to the above members, Harley E. Johnson of the nominating committee has also entered the service.

Capt. W. M. Vandersluis Lieut. R. M. Phinney Capt. E. L. Adams

Capt. E. L. Adams was appointed senior signal engineer, Bureau of Valuation, Southern district, Interstate Commerce Commission, with headquarters at Chattanooga, Tenn., in 1914, and remained in the service of the Bureau of Valuation until September 3, 1917, when he was called into the military branch as a captain of engineers in the United States Officers Reserve Corps, and was sent to Ft. Leavenworth, Kan., for further training. On December 5, 1917, he was attached to the 112th Engineer Regiment at Camp Sheridan, Montgomery, Ala., and received orders in January, 1918, for overseas duty. He arrived in France about February 1, 1918. His company and regiment number are unknown, his address being U. S. Expeditionary Forces, France.

Capt. Adams is well known in the Railway Signal Association, in which he has been a very active member. In 1908 he was vice-chairman on the special committee of the Railway Signal Association for storage battery jars and accessories for automatic signal work, and in the same year he also served on a special committee on rubber-covered wire. In 1909 he served as vice-chairman on a special committee reporting on wires and

cables. This committee in 1910 was designated as Committee No. 9. He served continuously as vice-chairman of Committee No. 9 from 1909 to the time of his entering the army in 1917. In addition to the above assignments he also served on Committee No. 4—Automatic Block, from 1911 to 1915, inclusive.

Lieut. Robert M. Phinney was assistant engineer in the signal department of the Chicago & North Western when he accepted a commission as first lieutenant in the 415th Railway Telegraph Battalion, under Major Sherwood's command, in January, 1918. Lieut. Phinney has taken an active part in the Railway Signal Association work and served on Committee No. 4—D. C. Automatic Block Signals—continuously from 1913 until the time of his entering the army. In 1917 he was vice-chairman of this committee. In 1915 he also served on Committee No. 9—Wires and Cables.

Capt. W. M. Vandersluis was appointed signal engineer of the Illinois Central on December 16, 1912, which position he held until he was called into the service, after having accepted a captain's commission in the United States Officers' Reserve Corps. He was called to Ft. Leavenworth training camp on September 5, 1917, and was assigned to the 35th Engineers at Camp Grant, Rockford, Ill., on December, 1917. He received orders in January, 1918, for overseas duty and arrived in France about February 1, 1918. His company and regiment number are unknown, as he was unassigned at the time of leaving.

Capt. Vandersluis took an active part in the Railway Signal Association. In 1907 he was chairman of Committee No. 7 on Copper and Iron Wires for Pole Lines. From 1914 to 1916, inclusive, he was chairman of Committee No. 4—Automatic Block. In 1915 he was on a special committee on Contracts. In 1916 and 1917 he served on Committee No. 1—Signaling Practice, and in 1916 he was also on a special committee on Harmonizing of Specifications. In 1917 he also served on the committee of committees and on the finance committee of the Board of Direction.

In addition to the above members of standing committees who are now in military service, Major R. F. Morkill, signal engineer of the Grand Trunk, has been another active member in the Railway Signal Association. Major Morkill enlisted as a supernumerary second lieutenant in the Canadian Engineers early in October, 1914. He was at once sent to England for training and was sent to France about February or March of 1915. He served in France until June, 1915, when he was made a full lieutenant and transferred to the Royal Engineers. He was then sent to England on special work and remained there until the latter part of December of the same year, when he again returned to France, and has been there continuously since. He was successively promoted to Captain and Major and was presented with the Military Cross in the New Year's honors of January, 1917. In August, 1917, he was transferred to the Grand Headquarters staff and placed in charge of all of the signaling on the British railways in the occupied portions of France and Belgium. Before going to press a wire was received reading that "Major Morkill's present title is Railway Signal Engineer, and he is a staff officer to the chief railway construction engineer."

Another member who has taken an active part in the Railway Signal Association is Major Azel Ames, Jr. Major Ames has been connected with the New York Central Lines, the Block Signal and Train Control Board and with the Kerite Insulated Wire & Cable Company. In 1907 and 1908 he was chairman of Committee No. 12, Rubber-Covered Wires, and in 1908 he also served on Committee No. 1 on Signaling Practice, and on Committee No. 7, Subjects and Definitions. He is at present a Major in the 61st Regiment, Coast Artillery, and is located at Fort Screven, Savannah, Ga.

In addition to the above men, records show that the following men have entered some branch of the service: W. G. Atwood, Assistant District Engineer, Bureau of Valuation, Interstate Commerce Commission, Chattanooga, Tenn.; A. M. Bears, signal supervisor, C. P. R.; P. E. Carter, sales engineer, General Railway Signal Company, New York; C. W. Cochran, engineer maintenance of way, C. C. C. & St. L., Galion, Ohio; D. K. Crawford, signal draftsman, A. T. & S. F., Topeka, Kan.; C. M. Deardorff, sales engineer, General Railway Signal Company, Chicago; C. L. Falk, signal maintainer, Wabash, St. Louis, Mo.; John H. Finney, manager, Washington office, Aluminum Company, Washington, D. C.; John S. Hall, transportation student, C. P. R., Montreal; R. B. Johnson, assistant engineer, General Railway Signal Company, of Canada, Lachine, P. Q.; C. B. Keers, signal construction foreman, A. T. & S. F., Topeka, Kan.; Roy Kimple, signal draftsman, N. Y. C., Cleveland, Ohio; F. Kingsley, associate editor, Electric Railway Journal, New York; W. Landesburg; E. R. Lindsey, signal inspector, C. & E. I., Chicago; C. A. Lyon, signal draftsman, I. C., Chicago; W. P. Martin, signal inspector, I. C., Chicago; William J. Payne, inspector, Saxby & Farmer, Ltd., Montreal; L. M. Perrin, senior signal engineer, Interstate Commerce Commission, Bureau of Valuation, San Francisco; M. Roginsky; S. E. Rollins, signal draftsman, I. C., Chicago; O. B. Ruggles, signal supervisor, B. & M., Salem, Mass.; F. J. Ryan, signal draftsman, I. C., Chicago; D. A. Scarnickia; C. D. Symes, signal inspector, D. W. & P., Virginia, Minn.; E. A. Warner, Jr., commercial department, Union Switch & Signal Company, Swissvale, Pa.; H. E. Johnson, signal inspector, C. & O., Richmond, Va.

In addition to the above members who are in military service, C. E. Denney, assistant to the president of the N. Y. C. & St. L., for some months past put in a good part of his time at Washington as general agent, American Railway Association, in the office of Col. Littell, quartermaster's office, who was in charge of cantonment camps. Mr. Denney was looking after the transportation end of the work in this department.

F. A. Bushnell Appointed on Regional Director's Staff

F. A. Bushnell, purchasing agent of the Great Northern at St. Paul, has been appointed a member of the Regional Purchasing Committee on the staff of the regional director, R. H. Aishton, in place of Ira O. Rhoads, purchasing agent of the Southern Pacific, whose appointment was announced last week.

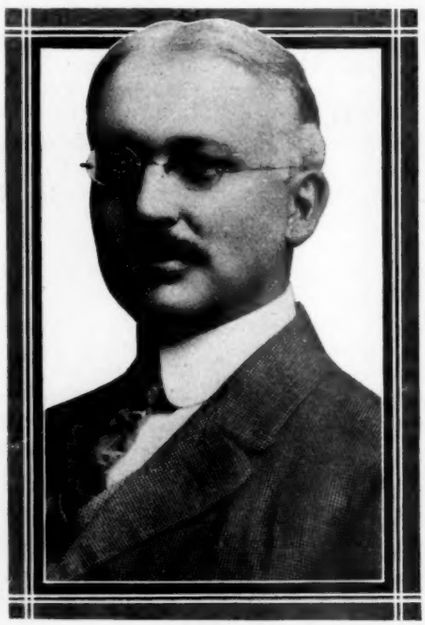
Reunion of Santa Fe Men

The fourth annual luncheon of the past and present members of the Santa Fe Signal Supervisors Committee was held in the French room of the Congress Hotel on Monday noon. Those present were T. S. Stevens, signal engineer, L. Brown, assistant signal engineer, and H. Hobson, signal supervisor of the Santa Fe; G. R. Cowherd, signal engineer, El Paso & Southwestern; B. T. Anderson, assistant signal engineer, Delaware, Lackawanna & Western; H. K. Ferguson, secretary Austin Company, and J. S. Hobson and J. E. Saunders of the Union Switch and Signal Company.

First War Show of Railway Appliances Association

Importance of Transportation During World Conflict Increases Need for Coliseum Exhibition

THE CHANGING CIRCUMSTANCES attending the prosecution of the war, the uncertainties following the assumption of control of the railways by the government, the dormant condition of the railway market, the heavy demands of munitions and other war contracts on railway supply factories and the necessity of railway men giving almost unremitting attention to their official duties—all were factors which tended to discourage the exhibition of railway devices at the Coliseum this year. Some of the more timid members of the National Railway Appliances Association were for a time opposed to holding the show, but the courage, foresight and sound judgment of the officers and directors of the organization prevailed and one of the largest expositions of railway devices and materials ever held is now a fact. The association makes no apology for conducting its first show in war time and rightly so, for never before have there been so many new railroad officers for whom it will prove of material practical assistance and educational benefit as this year. E. H. Fritch, secretary of the American Railway Engineering Association, reports that 103 members are now with the colors, and, needless to say, the appointment of their successors and the incidental changes in railroad organization involved thereby have modified the personnel of railroad construction and maintenance of way departments, as it has never been changed before in so short a time. That the judgment of the officers of the supply association was well founded was evidenced by the unusual demand for individual passes to the show after the usual allotment of 12,000 invitations had been sent out. A large share of these special requests came from the East, a section of the country from which many thought the attendance would be light on account of unprecedented operating difficulties resulting from the war.



E. H. Bell, President

From the point of view of government control the exhibition is particularly well justified, for the paramount problem confronting Mr. McAdoo is to increase the capacity of the transportation system of the country and to do it quickly. It is common knowledge that he contemplates more extensive additions and betterments than have been undertaken for many years and the execution of this program demands the best brains and the most conscientious efforts of railroad officers and railway supply men alike. It is especially fitting, therefore, on the eve of this period of quickened activity, that leading engineers, both in railroad service and in the supply industry, should gather together to exchange ideas and to appraise the latest developments in the design and manufacture of railway appliances. It has been well said that transportation, next to our military and naval arms, is the most important factor in the successful conduct of the war. It is consequently vital that inventive genius be stimulated to the utmost to the end that all means possible be utilized to make our railroads more efficient in the performance of their important function. The value of the Coliseum show is, therefore, even greater than in times of peace and of even more benefit to the railway officer, no matter how heavily burdened he may be with his regular duties. As yet no dependable prophet has appeared to forecast the date of the termination of the war and hence it is the wiser course to prepare for all exigencies which may arise in a long struggle. If the conflict does last for several years longer the holding of a railway appliance show this year and in succeeding years will prove one of the most effective means of stimulating progress in railway methods and practices and thereby making final victory more certain.

For the very purpose of making possible the most extensive and varied exhibition of devices, the association increased the number of available spaces in the Coliseum, with the result that 267 booths are occupied this year as compared with 237 in 1917. So far as possible old exhibitors were given their old spaces, while others were assigned booths on the basis of "first come, first served."

The annual railway appliances exhibition has reached such large proportions that its successful management and economical conduct demand organizing genius and executive ability of no mean order. The experience of each succeeding year has proved profitable in pointing the way to further innovations in policy and methods, and this year's preparations for the show were carried on with particular expedition. Whereas much of the work of constructing booths and placing exhibits had to be done hurriedly in 1917, this year 102 work orders were in before March 1 and 90 per cent of the appliances for display were in Chicago before March 8, despite the unusual delays in transportation. All freight moving to the show is consigned directly to the secretary of the association, who provides special shipping tags for this purpose, and as soon as it arrives it is placed in storage, from which it is removed to the Coliseum as soon as the booths are completed. In a like manner all work connected with decorating and wiring the hall, constructing the booths, etc., is handled by the association to prevent delays and confusion resulting from the closing of individual contracts for this work by the exhibitors. This plan has the added advantage of preventing the exaction of exorbitant prices, for contractors must base their bids on the basis of dealing with the association again in succeeding years. The methods, above outlined, are an indication of the painstaking efforts of the officers and directors of the association to carry on the exhibition most economically and efficiently. The one end which they aim to achieve is to make the show pay for itself and

C. W. Kelly, Secretary
P. C. Jacobs
F. J. Johnson

M. J. Trees, Vice-President
J. B. Strong
G. C. Isbester

H. M. Sperry, Honorary Director
E. E. Hudson
J. Alexander Brown

produce the maximum results from the amount expended. Needless to say the exhibition is not a profit-making undertaking and any surplus which may be made is carried over to the succeeding year.

The railway appliances exposition is new not only to many railroad officers, but to a considerable number of railway supply representatives who have taken the places of those who have gone to the colors. Practically all railway supply companies have contributed their share of men to our armed forces. Perhaps the most prominent member of the National Railway Appliances Association is Lieut.-Commander George C. Isbester, a director of the association, and now in the service of the U. S. Navy as a paymaster in the supply department at Chicago. Several firms have service flags displayed at their booths to indicate the numbers of their employees who have responded to the call of the government.

The officers and members of the board of directors of the National Railways Appliances Association are as follows: President, E. H. Bell, Railroad Supply Company, Chicago; vice-president, M. J. Trees, Chicago Bridge & Iron Works, Chicago; secretary, C. W. Kelly, Kelly-Derby Company, Chicago; honorary director, H. M. Sperry, publicity representative of the Union Switch & Signal Company, the General Railway Signal Company, the Hall Switch & Signal Company and the Federal Signal Company, New York. Directors: P. C. Jacobs, H. W. Johns-Manville Company, Chicago; J. B. Strong, Ramapo Iron Works, Hillburn, N. Y.; J. Alexander Brown, Pocket List of Railroad Officials, New York; Lieut.-Commander G. C. Isbester, United States Navy, Chicago; E. E. Hudson, Waterbury Battery Company, Waterbury, Conn.; F. J. Johnson, American Hoist & Derrick Company, St. Paul, Minn.

Edwin H. Bell, president of the association, is president of the Railroad Supply Company, Chicago. He was born in Philadelphia, Pa., and has been a resident of Chicago since 1896. After attending the public schools and graduating from the Blairstown Academy, Blairstown, N. J., he took a course in business training in the Pearce Business College at Philadelphia. In 1890 he was employed in the general manager's office of the Lehigh Valley at Buffalo and in 1897 he entered the employ of the Railroad Supply Company. In 1906 he was elected vice-president of his company and continued in that capacity until January, 1916, when he was elected president to succeed Henry S. Hawley, deceased. A large part of the success of the exhibit this year is due to the courage of Mr. Bell in advocating the importance of proceeding with plans for the display when some members of his cabinet thought for a time that it should be postponed this year.

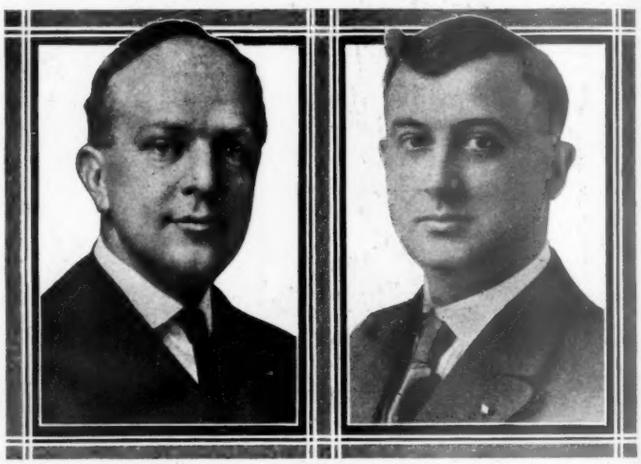
New R. S. A. Committee Chairmen

AMONG THE CHAIRMEN of committees of the Railway Signal Association this year there appear the names of four new men. Committee No. 5—Maintenance and Operation—is headed by L. R. Mann. Committee No. 12—Contracts—was headed by C. A. Christofferson, but as he refused to accept the chairmanship, R. C. Johnson was reappointed in his place. Committee No. 13—Electric Testing—is headed by P. M. Gault, and Committee No. 16—Harmonizing of Specifications—is headed by F. B. Wiegand. Of these four new committee chairmen Mr. Johnson and Mr. Wiegand served as heads of committees last year. This leaves Mr. Mann and Mr. Gault as the only new members heading committees.

Mr. Mann was appointed on committee No. 5 in 1909 and in 1910 he was made vice-chairman, in which capacity he acted from 1910 to 1918, when he was appointed chairman. In addition to being chairman of committee No. 5, he is also chairman of the St. Louis Regional committee and as a member of the Board of Direction is on the convention arrangements committee.

It will be the duty of committee No. 5 during the present year to prepare instructions for the maintenance of mechanical interlocking plants and of stationary and portable storage batteries. It shall also be the duty of this committee to investigate and report on methods of handling trains by signal indications without train orders, a very live subject at the present time, inasmuch as the elimination of a large number of train orders will do much to keep the long trains moving, which otherwise would have to stop at various train order stations to sign for 31 orders.

Mr. Mann has had an extensive and varied experience in signal work. He began with the Chicago & Alton in 1900, being engaged on the construction and maintenance of automatic block signals from 1900 to 1902 and serving from a laborer to a signal foreman on this line.



L. R. Mann P. M. Gault

In 1902 he went to the General Railway Signal Company as a mechanic on the construction of electric interlocking and served as mechanic and as foreman with this company in 1902 and 1903. From 1903 to 1904 he was connected with the Lake Shore & Michigan Southern on the maintenance of interlocking and block signals between Erie, Pa., and Buffalo, N. Y. In 1904 he accepted a position as general foreman on the maintenance and construction of signals on the Atlantic Coast Line and was located at Waycross, Ga. He served in this capacity until 1905, when he was appointed supervisor of signals on the Missouri Pacific, serving in this capacity until 1916, when he was appointed general signal inspector for the Missouri Pacific-Iron Mountain system, which position he holds at present.

P. M. Gault, the new chairman of committee No. 13 on Electric Testing, became a member of the Railway Signal Association in 1909 and served on committee 7, covering Definitions in 1913 and 1914, and on a special committee in 1914 on Methods of Recording Signal Performance. He has been connected with committee 13 since 1915, and acted as vice-chairman in 1916 and 1917. In addition he is the chairman of the Chicago Regional committee.

Committee No. 13 has been assigned to prepare, for this year, instructions for testing relays, indicators and

signal repeaters; to prepare tables of standard ranges and scales for electric testing instruments; standard forms for recording results of tests, and a specification for adjustable resistances to be used in testing purposes.

Mr. Gault is a 1906 graduate in electrical engineering at Ohio State University. After graduation he entered the service of the Pennsylvania Lines West of Pittsburgh as a signal apprentice and was assigned to the eastern division of the P. F. W. & C. After completing his apprenticeship course he was appointed signal inspector of the Chicago Terminal division in 1910. In April, 1913, he resigned his position with the Pennsylvania Company and entered the service of the Illinois Central as supervisor of signals of the Illinois division, with headquarters at Champaign, Ill. In April, 1914, he was promoted to signal inspector, working out of the signal engineer's office. In January, 1915, he was promoted to the position of office engineer in the signal department. This position he held until October, 1917, when he was promoted to pilot signal engineer in the valuation department. In February, 1918, he was promoted to assistant engineer in the valuation department.

N. R. A. A. Has Attractive Exhibit at the Coliseum

Re-arrangement of Space Necessary to Accommodate Exhibitors; Thirty-six New Companies Have Displays

THOSE WHO HAD HARBORED THE faintest doubt regarding the success of the National Railway Appliances Association exhibit this year had their fears completely allayed by the appearance at the Coliseum at nine o'clock yesterday morning when this organization opened its tenth annual show. With a few minor exceptions, all exhibits were ready and the universally expressed opinion is that the show, as a whole, presents a better appearance than in any previous year. There is just as much enthusiasm, just as much effort to interest and instruct the visitors, and just as much optimism as at any previous show, with the difference that the increased experience of the exhibitors has enabled them to display their devices to better advantage each year. Special pains have been taken through various ingenious methods to explain appliances more thoroughly and, as nearly all materials and appliances shown have seen actual service, the supply firms, as heretofore, are not overlooking opportunities to demonstrate actual results secured.

The display will continue as usual for four days, Monday to Thursday, inclusive, and, according to established precedent entrance is by means of tickets, a large number of which have been distributed among railway men. However, a pass or other evidence of railway employment will admit one.

While the improved appearance has been brought about in part by a more artistic treatment of the decorations of the hall and individual booths, a unity of treatment of the booth arrangements has been most effective in accomplishing the desired result. The idea as carried out has been particularly effective in the Annex, which has been made an integral part of the show. A material improvement was made last year in placing the main entrance to the exhibit in the Annex, and this plan has been retained this year with excellent results.

The most important change this year is the rearrangement of the aisles, which consists primarily of the elimination of the main east and west center aisle. This has been effective in increasing the available exhibit space, these changes having provided for 31 additional booths. While familiar devices and familiar faces greet the eye in the many corners of the show, a large number of new features present themselves in the displays of 36 new exhibitors who occupy 58 exhibit spaces in addition to the 119 old exhibitors. The accommodation of the newcomers presented one of the most formidable problems in arranging for this year's show. One outcome of this was the arrangement for 31 extra exhibit spaces, as noted above, while the remaining space was provided through the release of 27 spaces by old exhibitors. Thus the 119 firms who occupied 236 spaces last year make use of only 209 this year. For most part this reduction in space has been accomplished without any change in the policy of the exhibitors, although some of the signal companies are not showing as complete displays as in former years.

While somewhat broader in its scope this year, there has been no change in the firmly established policy of providing an educational display of devices interesting to men in the railway engineering and maintenance of way field. While occurring simultaneously with a convention of higher officers of these departments, special efforts have been made to reach the men in subordinate positions, a policy which has borne fruit in an ever-increasing attendance of supervisors and roadmasters with not a few foremen.

List of Exhibitors

The following is a list of the firms presenting exhibits, with the devices on display and the names of the representatives present at their booths:

A. G. A. Railway Light and Signal Company, Elizabeth, N. J.—A. G. A. railway grade crossing signal; highway danger signal; railroad signal lights—unison flash, single flash and steady light. Represented by J. K. Howard, C. S. Tiemann, A. G. Shaver and H. E. Gifford, Jr. Spaces 39 and 40.

Adams Motor & Manufacturing Company, 3914 Castello Avenue, Chicago.—Inspection motor cars. Represented by W. E. Adams, L. Gerhardt and A. P. Grenier. Spaces 218 and 218½.

Adams & Westlake Company, Chicago, Ill.—Signal lamps and lanterns; switch locks. Represented by G. L. Walters, A. S. Anderson, W. J. Piersen, C. B. Carson and H. G. Turney. Spaces 87, 88, 106 and 107.

Ajax Rail Anchor Company, Chicago.—Rail anchors. Represented by H. G. Elfborg, A. W. Holmberg and H. W. Reynolds. Space 89.

Alexander Crossing Company, Chicago, Ill.—Continuous rail crossing. Represented by Lewis Alexander, P. E. Scott, G. B. Alexander and L. C. Keenan. Spaces 228, 229 and 230.

Alger Supply Company, Chicago.—Represented by J. M. Fitz-Gerald and O. S. Flath. Space 167.

Allith-Prouty Company, Danville, Ill.—Electrically operated door hardware; fire door hardware; freight and warehouse door hardware. Represented by A. Vere Martin, H. R. Maxwell, I. D. Cotterman and F. E. McClimans. Space 184.

American Hoist & Derrick Company, St. Paul, Minn.—"American" railroad ditcher. Represented by F. J. Johnson, C. C. Austin and Clark Hook. Space 88½.

American Kron Scale Company, New York, N. Y.—Railroad portable scale and railroad attachment. Represented by W. W. Camp, E. Ohnell, C. F. Larson, E. M. Abramson and F. M. Franklin. Space 214.

American Steel & Wire Company, Chicago, Ill.—Steel fence posts; woven wire railroad fence; wire rope; rail bonds; Amerite signal wire. Represented by B. B. Ayers, J. F. Alexander, L. P. Shanahan, J. W. Collins, J. W. Meaker, Jr., C. S. Knight, Jr., B. H. Rider, C. F. Wiley, William Pfundt, M. Floto, E. J. Conkling and P. J. Hindmarsh. Spaces 70½ and 71.

American Valve & Meter Company, Cincinnati, Ohio.—Poage water columns; economy switch stands; Anderson interlocking

switch stands; Anderson safety switch appliances. Represented by J. T. McGarry, F. C. Anderson, J. De Pinal and D. Higgins. Spaces 130, 131 and 132.

American Vulcanized Fibre Company, Wilmington, Del.—Vul-Cot fiber insulation for railway signals. Represented by C. W. Sutton, C. C. Bell, W. A. Jordan, Wm. Maxwell and John Barron. Space 126.

Anti-Creeper Corporation and Anchor Company, New York.—Bowman efficiency rail anchor. Represented by W. E. Burke, T. B. Bowman, Bob Evans, Orlando Metcalf and Ellsworth L. Mills. Space 192½.

Armco Iron Culvert Manufacturers, Middletown, Ohio.—Corrugated culverts; roofing; metal lath and other products for railway use made from rust-resisting Armco iron. Represented by B. G. Marshall, Thomas Smith, G. F. Ahlbrandt and F. B. Milhoan. Spaces 99 and 100.

Asbestos Protected Metal Company, Pittsburgh, Pa.—Asbestos protected metal; roofing and siding; A. P. M. gypsum roof construction; A. P. M. Waugh glazing construction; A. P. M. McAllister ventilators. Represented by John H. Vance, J. T. O'Neill and A. McAllister. Space 169½.

Associated Manufacturers of Malleable Iron, Cleveland, O.—Malleable iron castings of many kinds for cars, trucks and automobiles; testing machines. Represented by S. H. Standish, W. A. Draves, A. O. Buckius, F. C. Rutz and Jas. T. Llewellyn. Spaces 221 and 222.

Austin Company, Cleveland, Ohio.—Plans, specifications and views of standard railway and industrial building units. Represented by H. K. Ferguson, W. L. Bailey, W. F. Chambers and E. M. Haas. Space 150½.

Ayer & Lord Tie Company, Chicago, Ill.—Creosoted wood blocks for floors; creosoted materials. Represented by A. H. Noyes, W. H. Blythe and L. S. Eifel. Space 225.

John Baker, Jr., Chicago.—Asphalt for all purposes; Aspha-Way and Aspha-Bric for freight and ware house flooring, team-track paving, station platforms, etc. Represented by R. M. Elder and others. Space 201.

The Barrett Company, New York.—Barrett's specification roofing and bridge waterproofing; semaphore roofing; Everlastic Tylike shingles; Carbosota for wood preservation; Tarvia for railroad grade crossings and station platforms; Tar-Rok for sub-floor construction; Holt roof connections for interior drainage. Represented by C. F. Ames, C. T. Bilyea, W. S. Babcock, G. R. McVay and J. J. Ross. Spaces 107½ and 108.

Benjamin Electric Manufacturing Company, Chicago, Ill.—Various forms of lighting fixtures for right-of-way and maintenance of shops; industrial signals and electrical specialties; panel boards. Represented by G. B. Weber, A. E. Lubeck, M. J. Cleary, Ray Prior, J. T. B. Addington, O. L. Johnson, W. Cottrel and C. B. Harlow. Spaces 149½ and 150.

Bethlehem Steel Company, Bethlehem, Pa.—New Century adjustable model 51A switch stand; Steelton positive switch stand model 52A; U. S. A. non-adjustable switch stand. Represented by R. W. Belknap, J. F. Hennessy, E. B. C. Goyne, E. E. Goodwillie, Stanley H. Smith, Neil E. Salsich and K. C. Banks. Spaces 199 and 216.

Boss Nut Company, Chicago.—Boss lock nuts, bolts, nuts and rivets. Represented by J. A. MacLean, J. W. Fogg, C. Beaumont, W. G. Willcoxson and A. W. MacLean. Space 169.

L. S. Brach Supply Company, Newark, N. J.—Railway signal lightning arresters; crossing bells; telegraph apparatus; signal accessories. Represented by G. Gort, A. G. Brach and L. S. Brach. Space 2.

Bridges & Building Association, Chicago, Ill.—Represented by C. A. Lichty. Space 226.

Bryant Zinc Company, Chicago, Ill.—Models 1, 2 and 3 auto flags; gong type crossing bells; locomotive type crossing bells A. C. or D. C.; annunciators; relays; lightning arresters; resistance units; channel pins; bond wires; rail contacts; testing instruments; blue vitriol; battery zincs; battery coppers; primary batteries; signal accessories. Represented by A. F. Klink, Stanley C. Bryant, H. F. Worden, J. P. Costigan, W. P. Graves and A. Muller. Spaces 153 and 154.

The Buda Company, Chicago.—Motor cars; electric trucks; track drills; jacks; bumping posts; electric crossing gates; tool grinders; replacers; switch stands. Represented by F. E. Place, Wm. P. Hunt, Jr., L. M. Viles, M. A. Ross, R. B. Fisher, H. L. Miller, J. L. Artmaier, H. C. Beebe, C. H. Bull, W. C. Dyer, J. J. Gard, H. E. Arends, R. C. Horton, W. F. Hebard, E. Conant, R. M. Smith, M. A. Evans, A. C. Fiero, L. R. Griffin and P. G. Pendorf. Spaces 61, 62, 63, 64 and 65.

Carbic Manufacturing Company, Duluth, Minn.—Carbic portable acetylene lights; portable, low-pressure, acetylene generator for oxy-acetylene welding and cutting; Carbic combination portable light and oxy-acetylene cutting generator for wrecking outfit use. Represented by Gordon Paterson and C. H. Bolinder. Spaces 171½ and 172½.

Carnegie Steel Company, Pittsburgh, Pa.—Aeroplane crank case; submarine signal disk; aeroplane crank shaft; tractor gear; automobile fly wheel; turbine disk; rolled steel car wheel. Represented by Edwin S. Mills, N. M. Hench, C. B. Friday and Samuel Fray, Jr. Spaces 52½, 53, 71½ and 72.

Cast Iron Pipe Association, Chicago, Ill.—Cast iron pipe. Represented by F. E. Hutchins, R. C. McWane, W. E. Clow, L. J. Elliott and W. J. O'Day. Space 202.

Chicago Bridge and Iron Works, Chicago.—Model tanks and washout valve. Represented by M. J. Trees, H. C. Brown, C. M. Ladd, L. McDonald, F. L. Cook, R. M. Campbell, H. B. Horton, K. I. Small, H. B. Murphey, George T. Horton, O. A. Bailey, W. R. Manock, F. E. Lee and S. A. Poyer. Spaces 51 and 70.

The Chicago Flag & Decorating Company, Chicago.—Bunting signal flags; U. S. flags and flags of all nations; service flags. Represented by Geo. L. Glendon, Thos. Glendon, L. G. Magnusson and Walter Glendon. Space 186.

Chicago Malleable Castings Company, West Pullman, Chicago.—The Thomas rail anchor tie plate; Wightman rail joint. Represented by James S. Llewellyn and Warren M. Osborn. Space 142.

Chicago Pneumatic Tool Company, Chicago.—Oil-driven air compressor; oil engines; speed recorders; air and electric tools and rock drills. Represented by C. E. Walker, J. C. Campbell, C. A. Schumacher, C. B. Coates, E. C. Stroup, M. C. Reed and Geo. W. Favor. Spaces 115 and 116.

Chicago Railway Signal & Supply Company, Chicago.—Railway signaling apparatus and highway crossing protection devices. Represented by E. W. Vogel, C. N. Suhr, W. C. Martin, W. H. Dayton, Wm. M. McClintock, C. R. Ahrens, D. J. McCarthy and A. H. Anderson. Spaces 96, 97, 77 and 78.

Chipman Chemical Engineering Company, Inc., New York.—Photographs and other data on Atlas "A" weed killer and the progress of the Atlas "A" method. Represented by B. G. Thompson and E. N. Townsend. Space 205.

Cleveland Tractor Company, Cleveland, Ohio.—Tractors, industrial and farm. Represented by B. R. Tewksbury, K. P. Drysdale, C. Hougland and H. L. Greenfield. Space 185.

Crerar, Adams & Company, Chicago, Ill.—Track drills; Eureka bonding drills; Calumet die starters; Hercules and Standard trucks; waste; hammers; Joyce, Cridland jacks. Represented by Russell Wallace, W. J. Clock, Geo. Bassett, Arthur Martin, Charles Gregory and R. Bullard. Space 28.

D. & A. Post Mold Company, Three Rivers, Mich.—"D. & A." cement fence post machines; post reinforcements; specimen concrete fence posts; rod spacers; tie wires; etc. Represented by G. H. Dougherty. Space 63.

Detroit Graphite Company, Detroit, Mich.—Paint and colors of all kinds. Represented by L. D. Mitchell, A. H. Kuesel, W. D. Waugh, W. C. Bradford, J. J. Hogan, A. N. Bachner and T. R. Wyles. Space 108½.

Diamond State Fibre Company, Chicago.—Diamond fiber track insulation; ferrules; washers; end posts; continuous, Webber and Braddock angle plates; waste baskets; trucks; etc. Represented by Theo. Herkert. Space 13.

Paul Dickinson, Inc., Chicago.—Smoke jacks; chimneys and ventilators. Represented by A. J. Filkins, W. H. Dayton and L. G. Kelley. Space 98.

Dilworth, Porter & Co., Inc., Pittsburgh, Pa.—Represented by W. F. Schleiter. Space 27.

Dixon Crucible Company, Joseph, Jersey City, N. J.—Lubricating graphite and graphite productions. Represented by J. E. Simpson and J. A. Biel. Space 118.

The Domestic Engineering Company, Dayton, Ohio.—Delco light—a direct connected electric light and power plant. Represented by I. K. Stover. Space 14.

Duff Manufacturing Company, The, Pittsburgh, Pa.—All types of lifting jacks. Represented by C. N. Thulin, C. A. Methfessel, E. A. Johnson and T. A. McGinley. Space 91.

Edison Storage Battery Company, Orange, N. J.—Edison nickel-iron-alkaline storage batteries. Represented by H. G. Thompson, F. V. McGuiness, W. F. Bauer, E. T. Sawyer and H. J. Butler. Spaces 20 and 21.

Edison, Thos., Inc., Bloomfield, N. J.—The 400 and 500 ampere hour multiple plate battery; 400 and 500 ampere hour heat resisting glass jars. Represented by F. J. Le Preau, J. P. Rodman, P. A. Garrity, E. W. Brown, E. W. Newcomb, B. F. Hines, R. J. Frost and L. W. Willis. Spaces 18 and 19.

Electric Railway Improvement Company, Cleveland, Ohio.—Portable rail bonding devices; Erico portable welder; Erico featherweight arc weld rheostat; Erico portable oil furnace. Represented by W. E. Huber, F. T. Neff, M. T. Stanton and L. J. Rueker. Space 1.

The Electric Storage Battery Company, Philadelphia, Pa.—Axle lighting equipment; railway signal batteries; car lighting batteries. Represented by Godfrey H. Atkin, T. Milton, T.

Pardee, Wm. Heritage, J. A. Fitts, H. M. Beck and W. E. Dunn. Space 60.

The Eymon Continuous Crossing Company, Marion, Ohio.—Continuous rail crossing. Represented by J. H. Eymon and Byron E. Wilson. Space 170.

Fairbanks, Morse & Co., Chicago.—Fifteen-horsepower, type "Y," oil engine direct connected to 9 kw. generator in operation; standpipe; motor cars; centrifugal pumps; scales; electric motors. Represented by A. A. Taylor, L. H. Matthews, E. C. Golladay, F. J. Lee, G. W. Lewis, W. B. Lewis, D. K. Lee, F. M. Condit, F. P. Drinker, J. P. Flanagan, E. E. Pendray, H. E. Vergosen, E. J. Vergosen, E. J. Coverdale, J. D. Daggett, H. E. Vogel, Geo. J. Akers, G. Howard, H. J. Renkin, H. G. Balke, C. R. Denis, E. Lang, R. F. Koops and C. R. Story. Spaces 73-76 and 92-95.

Fairmont Gas Engine and Railway Motor Car Company, Fairmont, Minn.—Railroad mowing machine; section motor car; inspection car; handcar engine. Represented by F. E. Wade, D. G. Shephard, R. B. Ballard and W. F. Kasper. Spaces 41, 42 and 43.

Federal Signal Company, Albany, N. Y.—Reception booth. Represented by Carl Henze, W. H. Reicherd, H. C. Ware and C. N. Beckner. Spaces 56 and 57.

Frictionless Rail, The, Boston, Mass.—Demonstrating the uses of the frictionless rail. Represented by F. A. Barbey, S. W. Simonds, T. F. Dwyer, Jr., and Geo. Bryant. Spaces 133 and 134.

General Electric Company, Schenectady, N. Y.—Represented by W. J. Clark, H. L. Monroe, C. Darticos, A. P. Jenks, W. H. Sigourney, John Roberts, H. W. Stewart, H. M. Jacobs and L. W. Shugg. Spaces 35, 36 and 37.

General Railway Signal Company, Rochester, N. Y.—Represented by S. G. Johnson, F. L. Dodgson, L. Thomas, F. H. Jones, W. R. Young, J. R. Wills, H. W. Lucia, W. H. Workman, E. E. Jester and J. A. Geneser. Spaces 47 and 48.

Gould Storage Battery Company, Depew, N. Y.—Storage batteries. Represented by G. R. Berger, W. S. Gould, R. Graham, R. C. Hull and W. H. Conant. Spaces 157 and 157½.

William Graver Tank Works, Chicago.—Storage tanks; water softeners; water filters. Represented by W. R. Toppan. Space 138.

Grip Nut Company, Chicago.—Grip nuts. Represented by W. E. Sharp, B. H. Forsyth, H. E. Passmore, A. Roberts, J. E. Weatherford and C. J. Wymer. Spaces 190 and 191.

W. & L. E. Gurley, Troy, N. Y.—Engineering and surveying instruments: Transits, levels, plane tables and alidades, compasses, leveling and stadia rods, hydraulic current meters, water stage registers, etc. Represented by H. M. Dibert and W. S. Hopkins. Space 69½.

Hall Switch & Signal Company, New York, N. Y.—Reception booth. Represented by H. W. Wolff, J. A. Ritter, H. L. Hollister, D. R. Day and W. J. Gillingham. Spaces 85 and 86.

Hatfield Rail Joint Manufacturing Company, Macon, Ga.—Hatfield rail joints. Represented by U. R. Hatfield. Space 166½.

Hayes Track Appliance Company, Richmond, Ind.—Hayes derails. Represented by R. W. Slautterback, E. L. Ruby, S. W. Wallace, W. Harding Davis and S. W. Hayes. Spaces 140 and 141.

Hazard Manufacturing Company, Wilkes-Barre, Pa.—Signal wires and cables; wire rope. Represented by Albert W. Gabriel, Geo. P. Cady, H. B. Pflasterer, Geo. G. Steinbrenner, L. W. Allen, W. S. Hart, Thomas Keefe, C. P. Brodhun and L. W. Bevan. Spaces 3 and 4.

Hegeman-Castle Corporation, Chicago.—Clapp fire resisting paint; tool steel gears and pinions; electric arc welders; Anglo-American Varnish Company's products; target enamels. Represented by Walter H. Evans, B. A. Hegeman, Jr., C. C. Castle, E. D. Hillman and A. C. Sullivan. Space 137.

Hoeschen Manufacturing Company, Omaha, Neb.—Hoeschen crossing signals; track instruments and annunciators. Represented by F. K. Davis, G. H. Carlson and E. Willrodt. Space 181.

Hubbard & Company, Pittsburgh, Pa.—Track tools of various kinds. Represented by W. H. Remmel, J. V. Smith, Geo. H. McCammon, J. W. Hubbard and O. W. Youngquist. Space 143.

Ingersoll-Rand Company, New York.—"Imperial" pneumatic tie tampers; "Imperial" gasoline and electric motor-driven gang car with portable air compressors for operating tie tampers; pneumatic spike hammers for cut spikes; pneumatic spike drivers for screw spikes; pneumatic rail drills; pneumatic wood boring machines. Represented by W. H. Armstrong, C. W. Melcher, J. P. Gillies and Chas. Dougherty. Spaces 206 and 208.

International Filter Company, Chicago, Ill.—Showing the chemical feed of a water softener. Represented by W. N. Waterman, A. L. Hodges and Geo. H. Brown. Spaces 170½ and 171.

The International Steel Tie Company, Cleveland, Ohio.—International steel twin ties; International steel crossing foundation. Represented by Wm. P. Day, W. C. Mahon and V. E. Heglaw. Spaces 200 and 215.

Iowa Gate Company, Cedar Falls, Iowa.—Railroad fence gates. Represented by Albert Sauer and J. B. Clay. Space 193.

Johns-Manville Company, New York, N. Y.—Asbestos built-up roofing; asbestos ready roofing; asbestos shingles; smoke-jacks; pipe and boiler insulation; piston packings; fibre conduit. Represented by J. E. Meek, J. C. Younglove, G. A. Nicol, P. C. Jacobs, J. M. Borrowdale, Geo. Christenson, C. S. Clingman, F. W. Doty, H. Flannagan, C. D. Folsom, R. A. Hamaker, W. J. Hennessy, F. J. Horne, D. L. Jennings, W. H. Lawrence, C. E. Murphy, H. G. Newman, W. D. Otter, C. M. Patten, A. G. Pickett, H. B. Sewell, J. H. Trent, E. T. Wade and E. H. Willard. Spaces 174, 175, 176 and 177.

O. F. Jordan Company, East Chicago, Ind.—Spreader car model. Represented by Walter J. Riley and Robert E. Bressler. Space 220.

Kalamazoo Railway Supply Company, Kalamazoo, Mich.—Hand, push and velocipede cars; motor cars; track drills; track jacks; gauges and levels; electric valve grinders; electric rock drills; steel wheels; wood center wheels. Represented by Jno. McKinnon, D. A. Stewart, W. N. Sidnam, N. C. Study, F. E. McAllister, H. B. Miller, C. Jackson, W. Winterle and L. W. Bates. Spaces 22, 23, 24 and 25.

Kaustine Company, Inc., Buffalo, N. Y.—Sanitary waterless toilet and urinal. Represented by G. W. Hanibrook and D. A. Evans. Space 158.

Kelly-Derby Company, Chicago.—Warehouse and trailer trucks; semi-Diesel oil engines; perfect rail brace and tie plate combined. Represented by F. W. Adams, H. L. Bachman, W. H. Day, O. K. Fischer, H. H. Fry, W. B. Holcomb, Edw. E. Johnson, C. W. Kelly and F. G. Koehler. Spaces 11 and 30.

The Kerite Insulated Wire & Cable Company, Inc., New York.—Kerite insulated wires and cables. Represented by B. L. Winchell, Jr., George A. Graber, W. H. Fenley, J. A. Hamilton, P. W. Miller, J. W. Young and J. A. Renton. Spaces 49, 50, 68 and 69.

The Kettle River Company, Minneapolis, Minn.—K-R-Gunite battery vaults; K-R-Gunite telephone booth. Represented by J. L. Weatherly and C. H. Marquess. Space 168½.

Keystone Grinder and Manufacturing Company, Chicago.—Keystone grinders and attachments. Represented by S. S. Newman and John Wincrantz. Space 194.

Kilbourne & Jacobs Manufacturing Company, Columbus, Ohio.—Reception booth fitted with pictures of all-steel automatic air dump cars. Represented by J. Stanton Mossgrove and David Greene. Space 45.

Lackawanna Steel Company, Lackawanna, N. Y.—Abbott rail joint plates and Lackawanna hook shoulder tie plates; safety head angle bars. Represented by C. R. Robinson, A. P. Van Schaick, J. L. Hench, C. H. Hobbs, G. A. Hagar, F. E. Abbott and A. H. Weston. Spaces 33 and 34.

Layne & Bowler Company, Memphis, Tenn.—Working model Layne vertical turbine pump; turbine parts; shutter screen and Keystone wire wrapped screen for railway water supply. Represented by W. C. Curd and R. S. Charles. Space 90.

The Lehon Company, Chicago.—Mule-hide plastic car roofing; Mule-hide burlap-back car roofing; Mule-hide canvas coach and engine cab roofing; Per-bona insulating paper for refrigerator cars; Mule-hide cap strips and sill covers; Mule-hide building roofing; Mule-hide asphalt shingles; Mule-hide Slate-Kote roll roofing; Mule-hide treated fabrics and membranes. Represented by Tom Lehon, D. B. Wright, Wm. I. Orr and E. A. Magurn. Space 109.

Lipman Refrigerator Car & Manufacturing Company, Beloit, Wis.—Refrigerator car equipment; A. B. C. system of refrigeration and heating; A. B. C. car door; Edmond car door. Represented by C. E. L. Lipman, E. Lipman, W. W. Robinson, A. B. Melville and C. H. Woodward. Space 6.

Long Company, Chas. R., Jr., Louisville, Ky.—Signal colors and bridge paints; blue lead coating; and general line of station and bridge paints. Represented by Charles R. Long, Jr., Harry Vissering, G. S. Turner, W. H. Heckman, M. E. Keig and S. W. Russell. Space 90½.

The Lufkin Rule Company, Saginaw, Mich.—Measuring tapes, steel and woven; straight steel rules; mechanic's scales; spring joint folding wood rules; boxwood rules. Represented by S. B. McGee and Frank G. Brown. Space 121.

M. W. Supply Company, Philadelphia, Pa.—Vaughan rail benders; Vaughan splice straighteners; anchor guard rail clamps; Vaughan guard rail clamps; Vaughan switch heater (new device). Represented by D. F. Vaughan and C. Z. Vaughan. Spaces 82 and 101.

Macomber & Whyte Rope Company, Kenosha, Wis.—Wire rope of every description and for every purpose; model of wire

rope and wire mills built to scale. Represented by Edw. E. Robirds, Geo. S. Whyte, Jas. A. Boope and M. M. Gross. Space 89½.

MacRae's Blue Book Company, Chicago.—MacRae's Blue Book. Represented by Albert MacRae, L. R. Rollins, Lloyd Simonson, E. B. Cooke and Thos. H. MacRae. Space 9.

The Madden Company, Chicago.—Three men rail layer; Blair tie spacer; Wagner switch point straightener; Harris-Muff ballast screen; Richter blue flag derail; Richter automatic derail and turntable lock; Chicago steel fence post; Madden rail carrier. Represented by H. C. Holloway and T. D. Crowley. Space 195.

Marsh & Truman Lumber Company, Chicago.—Bloxonend flooring. Represented by M. G. Truman. Space 213.

C. F. Massey Company, Universal Concrete Products Company, Canadian Concrete Products Company, Chicago.—Reinforced concrete products; battery well; battery box; house; culvert pipe; telegraph pole; flag pole. Represented by C. F. Massey, Jos. F. Love, J. E. Moody, P. Kircher, E. M. Hatheway, Chas. Gilman, H. E. Burns, Dan R. Brown, J. J. Gruenfeld, E. C. Alexander, A. M. Swenson and B. O. Brooker. Spaces 54 and 55.

McGraw-Hill Publishing Company, New York, N. Y.—Complete list of the papers published by this company. Represented by Wm. Buxman, J. E. Mason, E. J. Hunt and Fay Crabs. Space 8½.

Mercury Manufacturing Company, Chicago.—Mercury tractor type "L"; Mercury trailer standard warehouse. Represented by John R. Bensley, W. W. Pace, Wilton Bentley, L. R. Millar, William I. Lott, S. F. Proctor and H. B. Johnson. Spaces 10 and 29.

The Alexander Milburn Company, Baltimore, Md.—Portable carbide lights; oxy-acetylene welding and cutting outfits and apparatus. Represented by S. B. Moats. Space 5.

Miller Train Control Corporation, Danville, Ill.—Miller train control cab instrument mounted on engineer's air brake valve and stand, together with full size cut-away section of the control, shoe bar, etc. Instrument will be connected with air to show operation. An automatic stereopticon will show slides of actual photographs as well as printed matter of an educational value. Represented by W. B. Murray, H. B. Miller, J. N. Garber, E. Murray and P. E. Herren. Spaces 197 and 197½.

Monroe Calculating Machine Company, Chicago, Ill.—Monroe calculating machines. Represented by H. H. Doty. Space 9.

Mudge & Co., Chicago.—Mudge motor cars. Represented by Burton W. Mudge, Robert D. Sinclair, Karl J. Eklund, Herbert Deeming, William B. Ross, George W. Bender, Fay E. Posson, Charles M. Mudge, Jean K. Vanatta, Clyde P. Benning, Hugh U. Mudge, Clive Hastings, Ellsworth Ingalls, Charles W. Simpson, William C. Jacobs, V. Pagett, Charles C. Smith and Frank Berz. Spaces 146, 147, 127 and 128.

National Carbon Company, Inc., Cleveland, Ohio.—Columbia R. S. A. No. 72 HV primary signal batteries; Columbia track batteries; storage batteries; Columbia dry batteries; Hot Shot batteries; carbon brushes; lighting, moving picture and photographic carbons; welding and searchlight carbons; Columbia flashlights and flashlight batteries; carbon telephone specialties—special forms in carbon. Represented by Chas. S. Pflasterer, W. H. Arkenburgh, J. M. Spangler, W. R. Pflasterer, R. J. Cox, L. W. Fischer, C. W. Wilkins, Wallace O'Connor, A. E. Pratt, R. W. Erwin, W. G. Waitt, R. C. Woods and R. S. Geraghty. Spaces 151 and 152.

National Concrete Machinery Company, Madison, Wis.—National reinforced concrete line; corner and brace fence posts for right-of-way fencing; National molds and reinforcements for concrete fence posts; Toohey timber dapper, a new device adapted for framing quickly and economically all sizes of bridge timbers and for framing car sills and other timbers used in car repairing work. Represented by J. B. Evans, M. H. Hovey, V. E. Rogers, E. A. Everett, W. Harding Davis, W. M. McClintock and Frank Sanders. Spaces 158½ and 159.

National Lead Company, New York.—Dutch Boy red-lead. Represented by A. H. Sabin and F. M. Hartley, Jr. Space 81.

The National Lock Washer Company, Newark, N. J.—Nut locks. Represented by F. B. Archibald, J. Howard Horn, R. L. Cairncross and A. T. Thompson. Space 192.

National Malleable Casting Company, The, Cleveland, Ohio.—Holdfast rail anchor; wedge lock anchor; malleable iron tie plates; malleable iron bridge washers; spools and angle washers; malleable iron rail braces. Represented by L. S. Wright, J. J. Byers and T. W. Aishton. Space 102.

National Railway Appliance Association, Chicago, Ill.—Enrollment booth. Represented by A. H. Kuerst, G. R. McVay, G. E. Geer, Thos. H. MacRea and W. G. Wilcoxson. Spaces 198 and 217.

National Surface Guard Company, Chicago.—Cattle guards (new design); rail saws; tie tongs. Represented by C. F. Hately, C. C. Zimmerman, H. O. Conklin and H. A. Smith. Space 211.

Geo. P. Nichols & Brother, Chicago.—Electric turntable tractor; model of electric transfer table. Represented by Geo. P. Nichols, S. F. Nichols, R. M. Gaston and N. Fries. Space 173.

Northwestern Motor Company, Eau Claire, Wis.—Railway motor cars. Represented by R. R. Rosholt and R. F. German. Spaces 196 and 196½.

Ogle Construction Company, Chicago.—Hoisting machine and miniature steel automatic coaling station. Represented by R. A. Ogle, L. S. Murphy, C. F. Bledsoe, Edw. Ernst and M. W. Powell. Spaces 12 and 31.

Okonite Company, The, New York, N. Y.—Reception booth. Represented by H. Durant Cheever, J. D. Underhill, W. R. Van Steenburgh, D. Woodhead, J. M. Lorenz, R. N. Baker, A. L. McNeill, E. G. Wilson, L. H. Irvine and C. S. Nolloth. Spaces 16 and 17.

O'Malley-Beare Valve Company, Chicago, Ill.—Valves and locomotive blowoff cocks; lock shield valve for oxy-acetylene service; globe; angle and "Y" valves for all service. Represented by Thomas O'Malley, Edward O'Malley, Joseph Gallagher, J. E. Brown, Jas. Pigott, G. A. MacLean, Herman Crews and Walter Morris. Space 114.

The P. & M. Company, Chicago.—Vaughan rail anti-creepers; P. & M. rail anti-creepers; Henggi rail anti-creepers; bond wire protectors. Represented by Fred N. Baylies, S. M. Clancey, J. D. Griswold, D. T. Hallberg, H. A. Hawes, R. D. Hawley, Geo. E. Johnson, J. E. Mahoney, Wm. A. Maxwell, Philip W. Moore, Fred A. Poor, John Reagan, W. H. Reaves, John Ritchie, P. V. Samuelson and L. S. Walker. Spaces 122-123.

Page Steel and Wire Company, New York.—"Copperweld" bare and weatherproof wire; bond wires; tie wires; nails; Armco (American ingot) iron wire; plain, galvanized and welding wire. Represented by W. T. Kyle, C. B. Semple, J. A. Roesch, Jr., F. W. Walters and W. S. Krenz. Spaces 182-183.

W. W. Patterson Company, Pittsburgh, Pa.—High-grade hardmade tackle blocks; wood blocks; manila rope; wire cable. Represented by W. W. Patterson, Jr. Space 145.

The Peyton Safety Rail Joint Company, Centralia, Ill.—Peyton safety rail joints. Represented by W. Perry, C. W. Witwer, J. M. Brown, C. Rettinghouse and M. C. Hughes. Space 172.

Pittsburgh-Des Moines Steel Company, Pittsburgh, Pa., Des Moines, Iowa, Chatham, Ont.—Railway water tanks; railway coaling station; railway oil tanks. Represented by W. W. Hendrix, Max Whitacre, C. L. Todd, W. P. Cogswell, H. J. Klinzing, A. C. Pearsall, Herbert Miller, J. E. O'Leary, W. A. Da Lee and W. V. Bickelhaupt. Spaces 83 and 84.

The Pocket List of Railroad Officials, New York.—Pocket List of Railroad Officials. Represented by J. Alexander Brown, Harold A. Brown and Charles L. Dinsmore. Space 26.

Positive Rail Anchor Company, Marion, Ind.—Rail anchors; switches; guard rails; tie plates; rail braces; switch point protectors; heel plates. Represented by Frank M. Robbins, J. A. Shoulty, L. C. Ferguson, A. H. Told, E. A. Le Beau and W. Harding Davis. Spaces 178, 179 and 180.

Geo. A. Post, New York.—Arch-neck railway spike. Represented by Geo. A. Post, James R. Steele, E. H. Walker, W. Eckels and Geo. A. Post, Jr. Space 204.

The Protective Signal Manufacturing Company, Denver, Colo.—Railway signal equipment—bells; relays; oscillators; time units; wig-wag signals; etc. Represented by Archie M. Adams, Will C. Neahr and Walter E. Wegner. Spaces 167½ and 168.

Pyrene Manufacturing Company, New York, N. Y.—Fire extinguishers; hose; reels; chemical engines. Represented by R. G. Henderson, W. D. Dorry, J. M. Johnston and H. V. Boykin. Space 160.

The Q. & C. Company, New York.—Compromise joints; Bonzano-Thomson rail joints; derails; replacers; skid shoes; emergency knuckles. Represented by C. F. Quincy, F. F. Kister, Jay V. Wescott, Edgar M. Smith, J. L. Terry, Roger B. Quincy, E. Ray Packer, William W. Hoit and A. R. Horn. Spaces 120 and 139.

The Rail Joint Company, New York.—Continuous, Weber, Wolhaupter and 100% Standard joints; continuous, Weber and Troy insulated joints; continuous step joints. Represented by V. C. Armstrong, W. P. Thomson, Benj. Wolhaupter, E. A. Condit, Jr., E. L. Van Dresar, Jas. A. Greer, Alex. Chapman, E. F. Schermerhorn, F. C. Webb, R. W. Payne, G. H. Larson, C. B. Griffin, R. W. Smith, W. S. Boyce, H. C. Hickey and Chas. Jenkinson. Spaces 79 and 80.

The Railroad Supply Company, Chicago.—Tie plates; derailers; wig-wag crossing signals; d. c., a. c. and motor-driven bells; relays; testing instruments; lightning arresters; annunciators; electric crossing gates; signal supplies and accessories. Represented by E. H. Bell, H. M. Buck, M. J. Fox, F. M. Hill, P. W. Kohnen, F. Lull, R. S. Prentice, A. H. Smith, H. G. Van Nostrand and F. C. Webb. Spaces 104 and 105.

Railway Age.—See Simmons-Boardman Publishing Company. Space 46.

Railway Electrical Engineer.—See Simmons-Boardman Publishing Company. Space 46.

Railway Maintenance Engineer.—See Simmons-Boardman Publishing Company. Space 46.

Railway Mechanical Engineer.—See Simmons-Boardman Publishing Company. Space 46.

Railway Review, Chicago.—Railway Review. Represented by Willard A. Smith, Harold A. Smith, W. M. Camp, C. L. Van Auken, A. E. Hooven; J. E. Gougeon, Chas. L. Bates and J. L. Lammedee. Space 44.

Railway Signal Engineer.—See Simmons-Boardman Publishing Company. Space 46.

Ramapo Iron Works, Hillburn, N. Y.—Manganese switch points; switch stands; switch slide plates. Represented by Thomas E. Akers, Arthur Gemunder, W. C. Kidd, Douglas E. Snow and James B. Strong. Space 109½ and 110.

Reading Specialties Company, Reading, Pa.—Guard rail clamps; car and engine replacers; rail benders; rail joints; tie spacers; rail straighteners. Represented by B. J. Buell and J. J. O'Connell. Spaces 45 and 46.

Roadmasters' and Maintenance of Way Association of America, Sterling, Ill.—Represented by P. J. McAndrews and Miss Anna McAndrews. Space 227.

Roos Foundry Company, Henry, Chicago, Ill.—Hardick lock and covered turnbuckle for switch adjustment. Represented by L. A. Ogden and William Hardick. Space 189.

Southern Pine Association, New Orleans, La.—Pine and its different treatments. Represented by Dr. H. Von Schrenk, A. L. Kammerer and H. W. Meinholtz. Spaces 203 and 202.

Squire-Cogswell Company, Chicago.—Volkhart water service hydrants and valves and specialties; Hauck kerosene torches. Represented by Willis C. Squire and Chas. P. Cogswell. Space 161½.

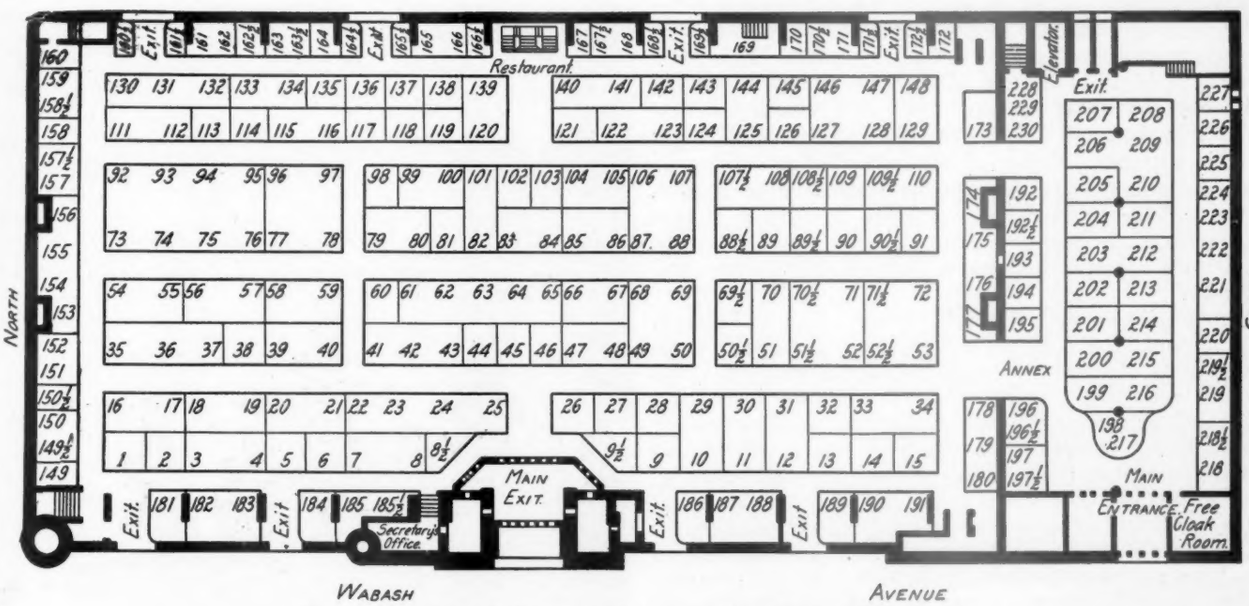
Standard Asphalt & Refining Company, Chicago.—Mineral rubber mastic floors; acid-proof floors; waterproofing; pipe coating; roofing; damp-proofing; paving; insulation; liquid coatings; acid-proof tank linings. Represented by R. F. Trumbull, H. C. Riehle, E. L. Hedrich, George A. Thornton, J. M. Woodruff and Charles Muller. Spaces 161 and 162.

Swain Company, Chicago.—Journal box publicator; journal box loose pulley and shafting cups; solid lubricators for all sizes of crank pin cups; metallic packing for all rods. Represented by Wm. H. Holmes and C. H. Holman. Space 185½.

Templeton, Kenly & Co., Ltd., Chicago.—Simplex car and track jacks; Simplex pole pulling jacks; Simplex emergency jacks; Simplex automobile jacks; Simplex shipbuilder's jack. Represented by A. C. Mills, W. B. Templeton, H. B. Burlow and J. H. Hummel. Space 32.

Toledo Scale Company, Toledo, Ohio.—Automatic dial scales; built-in type freight-house scale; self-contained type dormant scale; portable platform automatic dial scale. Represented by C. F. Moore, C. H. Hapgood, H. O. Hem, W. B. Pantall and H. D. Ridge. Space 15.

Track Specialties Company, New York, N. Y.—Trasco guard



Floor Plan of the Coliseum and Annex, Showing Booth Numbers

Safe Lock Switch Machine Company, Lexington, Ky.—Safe lock switch machine. Represented by Curtis Dougherty, D. M. Case and C. F. Jones. Spaces 163 and 163½.

Sellers Manufacturing Company, Chicago.—Sellers' anchor bottom wrought iron tie plates. Represented by J. M. Sellers, G. M. Hogan, R. A. Van Houten and R. J. Platt. Space 124.

Signal Accessories Company, New York.—Signal material. Represented by F. C. Lavarack and C. R. Ahrens. Space 119.

The Silver Steel Company, New York.—The Silver steel tie. Represented by Jos. A. Silver. Space 164½.

Simmons-Boardman Publishing Company, New York and Chicago.—Railway Age; Railway Maintenance Engineer; Railway Signal Engineer; Railway Mechanical Engineer; Railway Electrical Engineer. Represented by L. B. Sherman, Samuel O. Dunn, Henry Lee, C. R. Mills, Frank S. Dinsmore, F. H. Thompson, H. H. Simmons, H. H. Marsh, J. H. Bryan, J. M. Rutherford, R. H. Smith, E. R. Walker, E. T. Howson, W. S. Lacher, K. E. Kellenberger, J. G. Little, A. F. Stuebing, G. L. Lacher, E. T. Owens and T. E. Crossman. Space 46.

Simple Gas Engine Company, Menasha, Wis.—Gasoline engines with clutch and chain drive for railway motor cars, three, five and six horsepower. Represented by John P. Hrubesky, F. J. Oberweiser and John G. Walter. Space 165½.

T. W. Snow Construction Company, Chicago.—Oil and water cranes. Represented by T. W. Snow and Derby Snow. Space 50½.

rail clamp; Superior compromise joint; Superior derailers; rail benders; guard rail braces; adjustable rail shims. Represented by W. B. Lee. Space 207.

Union Switch & Signal Company, Swissvale, Pa.—Represented by A. L. Humphrey, G. A. Blackmore, L. F. Howard, W. P. Neubert, J. P. Coleman, J. E. Saunders, C. O. Harrington, H. A. Wallace, J. F. Talbert, W. P. Allen, Aaron Dean, H. W. Griffin, J. J. Cozzens, T. H. Patenall, J. L. Brastow, J. S. Hobson, W. W. Talbert, S. E. Gillespie, V. K. Spicer, J. L. Loucks, Geo. Marloff, J. D. Roett and H. R. Sheene. Spaces 66 and 67.

U. S. Wind Engine & Pump Company, Batavia, Ill.—Models and samples of railway water stations, water tanks, water columns, railroad double-acting pumps, stock yard windmills and pump switch stands. Represented by L. E. Wolcott, C. E. Ward, G. E. Vermilyer, J. P. Prindle and E. B. La Salle. Spaces 111 and 112.

Verona Tool Works, Pittsburgh, Pa.—Track tools; track jacks; levels; gauges; nut locks. Represented by H. Fischer, E. Woodings and H. C. Mull. Spaces 129 and 148.

Volkhardt Company, Inc., Stapleton Station, S. I., N. Y.—Non-freezing water hydrants. Represented by Wm. Volkhardt and Willis C. Squire. Space 160½.

The Walls Frogless Switch and Manufacturing Company, Kansas City, Mo.—Swing rail frog. Represented by C. E. Ennis and W. J. StoneBurner. Spaces 219 and 219½.

Waterbury Battery Company, Waterbury, Conn.—Waterbury unit cylinder primary battery; Waterbury plate type primary battery; Waterbury track battery; Schoenmehl primary battery; Gordon primary battery. Represented by C. B. Schoenmehl, G. A. Nelson, E. E. Hudson and S. J. Hough. Space 38.

Wayne Oil Tank & Pump Company, Ft. Wayne, Ind.—Oil tanks and self-measuring pumps. Represented by B. F. Geyer. Space 135.

West Coast Lumberman's Association, Seattle, Wash.—Lumber in various dimensions cut from Douglas fir. Represented by C. J. Hogue and D. H. Davis. Spaces 187 and 188.

Western Electric Company, New York, N. Y.—Railway telephone and selector dispatching circuits; flood lights; train lights; motor generator equipments for signaling. Represented by Jack C. Binning, Geo. Hull Porter, G. K. Heyer, T. J. Rider, H. K. Olmstead, F. A. Ketcham, Walter P. Hoagland, Will J. Davis and L. A. Muttart. Spaces 58 and 59.

The Wyoming Shovel Works, Wyoming, Pa.—Red Edge track shovels. Represented by G. E. Geer, H. C. Emery and H. T. Potter. Space 103.

Yale & Towne Manufacturing Company, New York, N. Y.—Locks; door closers, chain hoists. Represented by G. C. Fishleigh, L. W. Kregner, R. J. Kleinsmid and E. A. McGuire. Space 113.

Albany Regional Committee Report*

IN many parts of the country signal failures are often experienced during the winter months from frost collecting on motor commutators or contacts. This presents a problem to the signal departments to be solved with each recurring winter. Frost and moisture in signal mechanism and motor cases was discussed at length at this meeting. Some of the contributing causes of frost failures may be due to poorly fitted motor shields, motor shields cracked, poor gaskets for motor shields and mechanism doors, ventilators closed, no ventilators, high mica, causing brushes to arc and warm up commutator.

Frost failures were generally found to occur between 7 a. m. and 12 o'clock noon, depending principally upon the rays of the sun. Opening mechanism doors to clean motors when frost is forming on rails and iron poles will result in a frost failure. Failures from ice on motor commutators usually occur after a warm winter day when the temperature drops suddenly toward evening, just as the sun goes down. Motor and mechanism will have a sweating appearance and the motor commutator will have a very fine coating of ice. It has been found good practice not to open a case in severe cold weather unless absolutely necessary and at other times not before 10 a. m. and not after 3 p. m. on a sunny day. At these times the necessary work should be done in as brief a time as possible. Signals located close to a hill or mountain are less troubled with frost than those some distance away, while a signal located in a ravine near a mill pond seems to be an ideal spot for frost.

Some of the various methods employed in trying to counteract the effects of frost were the use of a wooden commutator shield, a special enlarged door, alcohol in mechanism case, alcohol on a sponge in commutator shield, the sealing up of bottom of mechanism, the installation of new gaskets for commutator shield and painting the outside of the mechanism case with aluminum. Others tried placing a packing of charcoal in mechanism cases but this did not seem to remedy the trouble. It is the opinion of most maintenance forces that proper ventilation is lacking in signal poles and mechanism cases and that providing a means for the proper circulation of air around the signal mechanism has been found to reduce frost failures materially. Another member present advised that on one section where considerable frost trouble was experienced this was remedied by closing up the ventilators with waste, plugging the hole in the bottom of the case with waste and setting small bottles of alcohol in the bottom of the cases, which seem to be most affected with the frost. No further trouble was experienced on these signals, but when they were cleaned in the spring the ones that had the alcohol in the cases had rusty mechanisms and bearings which was undoubtedly caused by the alcohol. Glycerine and vaseline were tried by placing them inside of the glass shield, covering the entire surface, but this did not prevent frosted motors. The same member stated that if the thermometer is higher than 10 deg. above zero it is too warm for frost to take effect, and if it is lower than 10 deg. below zero it is too cold for it to form unless it warms up very fast during the morning.

*From the abstracts published in the R. S. A. Journal for March, 1918.

"Split Spark" Lightning Arrester

THE "SPLIT SPARK" lightning arrester, manufactured by the Chicago Railway Signal & Supply Company, Chicago, is unique in its construction and effects in protecting signal apparatus on railroads. This arrester is the invention of Fred B. Corey, for many years with the General Electric Company at Schenectady, N. Y. The over all dimensions are 5½ in. long by 3 in. high. The porcelain base, which is hollow, condamp and insect proof.

The two R. S. A. standard binding posts at the ends are for "line" and "instrument." The middle binding post is the "ground." This binding post has a carbon disc, and immediately on each side of it there are two knurled nuts, presenting many fine points toward the carbon ground disc, to which the lightning discharges to ground. In the hollow base there are three sets of coils of heavy wire wound upon a fiber tube. These coils are impregnated, and the entire case is sealed, making it damp and inspect proof.

Split Spark Lightning Arrester

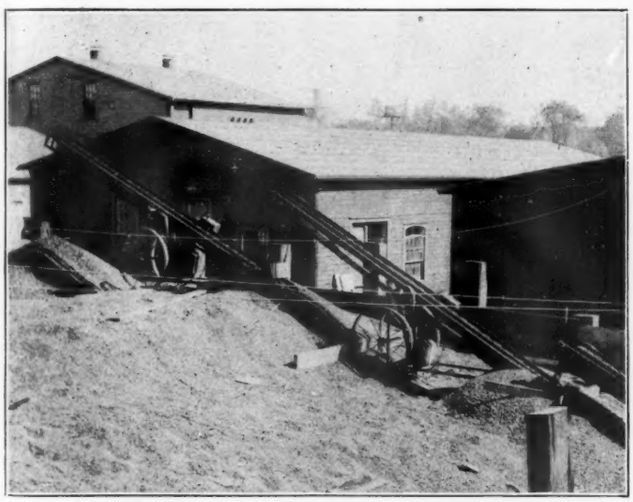
One of the coils is a choke coil, while the other two are compensating coils, wound in reversed directions and connected direct to the incoming "line" binding post. These compensating coils divide the incoming static or lightning discharge, so that a positive discharge takes place between both gaps simultaneously. One particular feature of this arrester is that it has two positive discharge paths and is so designed mechanically that a fixed distance is kept between the points at all times.

All coils are wound with heavy cotton-covered magnet wire, and the choke coil is the only coil offering resistance to the regular current going to the instrument, the compensating coils being connected directly to the incoming binding post.

To protect alternating current instruments the choke coil is eliminated. Extensive tests have shown that this arrangement offers no impedance and that lightning discharges are always equal between the two discharge points.

A Portable Motor Driven Conveyor

A NEW TYPE OF PORTABLE belt conveyor designed to be moved easily by one man, and which will handle loose materials such as coal, coke, ashes, crushed stone, sand or gravel and sacks, packages, boxes and manufactured products with equal facility, is being built by the Portable Machinery Company, Inc., of Passaic, N. J. The machine is operated either by an electric motor or gasoline engine and is known as a scoop



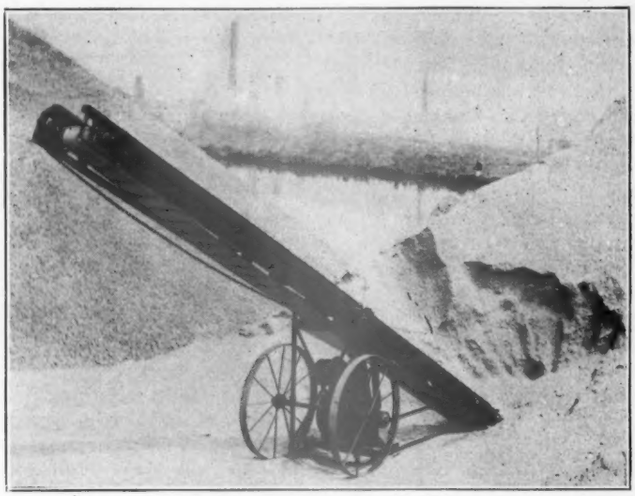
Increased Storage Capacity Is Gained by Using the Conveyor in Flights

conveyor because of the feature whereby the conveying belt receives its load of loose material through a scoop at the lower end which can be pushed or buried completely in the material to be handled.

The conveyor is built of steel and is mounted on wheels attached to the upright supports of the conveyor. The lower end of the conveyor is attached to the lower end of these uprights by pipe section members forming a triangle. The conveyor may be moved easily from place to place by inserting two pieces of pipe in the ends of the horizontal members for use as handles.

The power is transmitted to the conveyor from the driving motor, which is mounted on the horizontal supports by means of a chain and sprocket connection to a shaft extending underneath the conveyor. From a sprocket on the other end of this shaft the power is transmitted to the driving sprocket, which is located at the upper end of the conveyor.

In handling loose material the machine has a capacity of one ton in 1½ min., and in unloading loose materials from hopper or drop-bottom cars the lower end of the conveyor can be run under the car and the materials elevated from the track level, a distance of from 6 to 9 ft., to the storage pile. The conveyors can be used in sets of two or more to increase either the height of the storage pile or the conveying distance. The machines are particularly adapted for filling in or extending embankments by conveying cinders or other filling materials

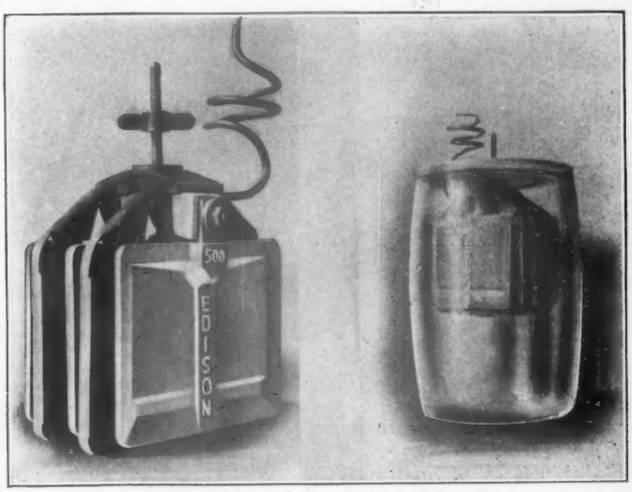


The Machine Showing the Belt Conveyor and Sprocket Drive

from hopper-bottom cars and discharging at the top of slope, thus obviating the necessity of an additional track along the top of the embankment.

Edison Multiple Plate Primary Cell

THOMAS A. EDISON, INC., has made an important improvement in primary batteries in the form of a multiple plate type cell which embodies a combination of two copper oxide plates and three zinc plates as illustrated below. The method of assembly provides for two copper oxide plates suspended in copper-plated steel frames which are clamped automatically into the



Multiple Plate Primary Battery

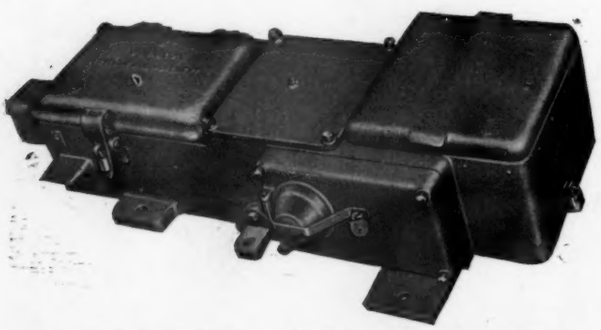
side of the plate, thereby insuring positive contact. The zinc plates are suspended from a rigid hanger bolted on to a cross bolt, the center zinc suspension having a jamb nut on each side.

The new element presents a very compact and rigid assembly, the mechanical structure of which insures a permanent fixation of the plates with the least amount of inactive material in its construction and thereby obtaining the minimum amount of displacement in the solution. As

shown in the illustration, horizontal slots are countersunk into the bottom panels of the zinc plates, the purpose of these slots being to indicate by their perforation the exhaustion of the cell. The design of the zinc plates is such as to enable the entire surface area to be maintained intact throughout the life of the cell, thus avoiding a decreasing surface as the cell becomes exhausted. The slots also provide a more positive means, and at a more definite point, for determining when the battery is ready for renewal. The physical improvement brought about by this latest development is the exposure of additional surface area of zinc and copper oxide plates at a greater height in the solution, thereby presenting a greater surface area of the elements in a more active solution. The effect of these physical improvements in the cell is to enable it to maintain a more constant voltage at any given discharge rate between the beginning and end of its life and to reduce to a minimum the CR drop in a cell when subjected to heavy discharges, especially under cold temperatures. The multiple plate type assembly is now being furnished in 400 and 500 ampere hours capacity to fit R. S. A. jars and covers and when furnished with barrel-shaped heat-resisting glass jars is known as Edison type M-404 and M-504, respectively. It is universally adaptable to all signal circuits, line circuits, track circuits, crossing bell circuits, low voltage switch machine circuits and signal lighting circuits.

U. S. & S. Co. New and Improved Devices

DURING THE LAST few years considerable economy in the operation of electro-pneumatic interlocking plants has been effected by the introduction of minor improvements in detail parts, the sum total of which has allowed a decided decrease in the amount of compressed air necessary for the operation of this type of interlocking. The improvements made in the switch valve have been responsible for a considerable portion of the saving in air. The Union Switch & Signal Company's improved Style "C" cutoff type valve is so designed that compressed air is held normally in only one

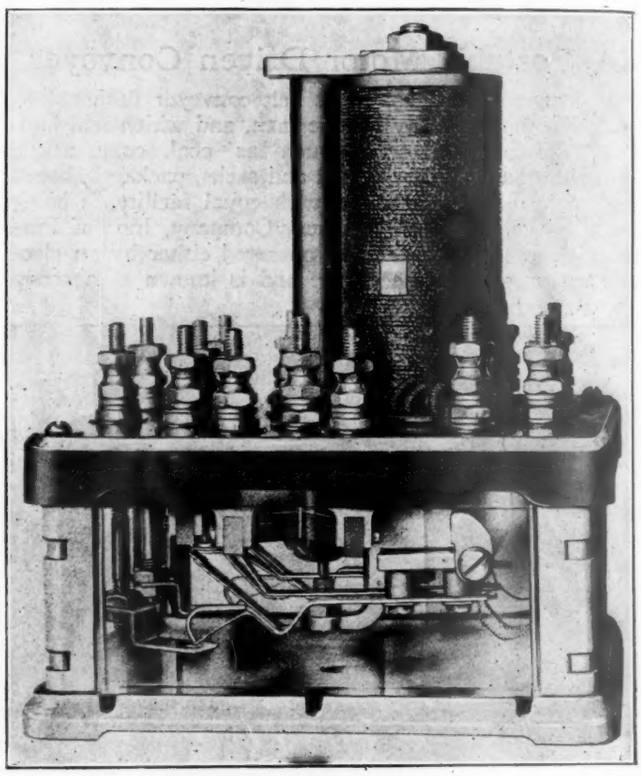


Style "M" Low Voltage Switch and Lock Movement

chamber and against only one electrically-operated pin valve. Another improvement in this valve has been the elimination of external tubing for interconnection of air chambers. The casting is now provided with internal ports for the flow of air between its chambers. The changes made in this style valve do not detract in any way from the recognized safety features which are characteristic of electro-pneumatic interlocking.

Style "M" Low Voltage Switch and Lock Movements

The Style "M" switch and lock movement recently developed was designed primarily to operate railway switches when provided with electrical energy. Realizing that this movement would have an extensive application in connection with the low voltage operation of outlying switches, consideration was given the fact that it might be necessary at times for the switch to be thrown over by hand, due to battery failure or disconnection. Because of the fact that the trainmen who would be required to operate the switch under these circumstances might not be acquainted with the mechanism, the opening for the reception of the hand crank was made prominent and a switch lock is used for fastening the cover of this opening in place. This was so located to bring it where it could not be overlooked. As an additional precaution, "Crank here" in raised letters has been placed in the gear case immediately over the hand crank opening. The point at which the crank is applied in the train of gears is such that no time is lost in throwing the movement over by hand.



Special Model 12 Neutral Polar Relay

Relay for Handling Low Voltage Switch Movements

In order to provide for the satisfactory control of low voltage switch and lock movements now being installed quite generally, the Union Switch & Signal Company has equipped its standard model 12 neutral polar relay with a special arrangement of contact-making parts. This relay is equipped with four front and two back contacts, which are arranged so that two silver-to-graphite contacts will ordinarily be depended upon for carrying the motor current, while two graphite-to-graphite contacts will break last as the relay is de-energized, in this way taking care of breaking the current used by the motor without injuriously affecting the contact parts. This relay provides a pressure of two ounces per contact when normally energized, as do all of the standard Model 12 and 13 Union relays.